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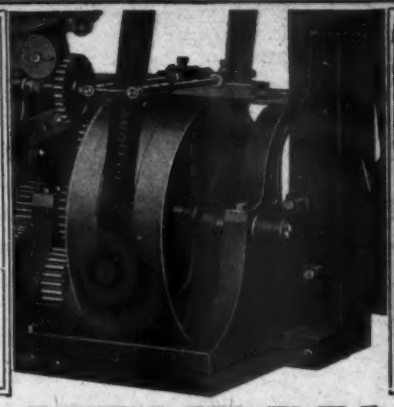

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THE

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SALARIES AND WAGES IN ELECTRICITY SUPPLY.

IN common with the rest of humanity, the central-station man, whether he claim the title of "engineer" or that of "employé," is subject to the great primal law of Nature—the law of self-preservation. He may have no undue craving for gold and silver; in normal times he may even be fairly content with his lot (though we have grave doubts with regard to such a phenomenon); but the fact remains that, as society is organised, an adequate supply of money is essential to his existence, not by virtue of its own intrinsic properties, but because it enables him to satisfy his physical needs. If in time of peace he had barely sufficient money to cover his requirements, it is clear that when the purchasing power of money has fallen by 50 per cent. he has an unquestionable right to a substantial increase in the nominal value of his payment, in order to bring its actual value up to a reasonable amount.

The fact is recognised by the Government, which has intervened in many industries of national importance at the instance of the Trade Unions concerned and awarded to the workers increased wages; in other cases the Trade Unions, without Government aid, have obtained advances for their members; but in the case of electricity supply the conditions are altogether exceptional, for there exists no body which can fairly claim to be representative of the whole of the interests concerned, and to be authorised to act on their behalf. Moreover, the gradation of rank in electricity supply from operative to executive and administrative posts is so gradual and continuous that, while it is impossible to bring all the members together in one society, it is exceedingly difficult to find a line of demarcation. Hence it is that a conflict, or at least a competition, has arisen between two societies, the Association of Electrical Station Engineers and the Electrical Trades Union, each of which claims the right to represent the central-station man and to act on his behalf. During recent weeks we have allowed both parties to set forth their claims and views in our "Correspondence" columns, in order that readers may be enabled to appraise their respective merits and capabilities, and in the hope that eventually means may be found to reconcile their differences and arrive at a satisfactory solution of the problem—the essence of which, as stated above, is to improve the conditions obtaining in the service of electricity supply.

In this issue will be found the report of a meeting of senior technical officers, and a letter from a "Chief Assistant," which, in our opinion, indicates that the solution is near at hand. We commend them both to the attention of readers interested in this subject, and we set forth below our own views on the matter.

In the first place, we regard the settlement of this

question as a matter of urgent importance; controversy is out of place—co-operation and agreement are essential, and some sacrifice of individual predilections is therefore indispensable, lest all should suffer. Secondly, we hold that no one society can possibly answer all the requirements. From the very commencement, the Association of Electrical Station Engineers has been handicapped by the existence of two parties within its ranks, with essentially different views and policies, and while this condition obtains it cannot possibly attain its aims. Reconstitution appears to be the only course that affords any prospect of success, and for this reason we welcome the movement that was set on foot at the meeting of senior technical officials of the London area at Hammersmith last week. The instruction to the Provisional Committee to invite the chief engineers of London undertakings to appoint representatives to meet the committee is particularly commendable; their assistance and support are indispensable to the attainment of the desired result.

In this connection, the suggestion of "Chief Assistant" is interesting—namely, that the chiefs themselves should take action towards forming a comprehensive association embracing all professional electricity supply engineers, whether attached to company or municipal undertakings, throughout the country, for the express purpose of promoting the interests of the members in all degrees. Mr. Wordingham, in his presidential address, pointed out the advantages derived from the formation of such associations, and would no doubt support the movement. The Institution of Electrical Engineers obviously will take no action tending towards the desired result; it rests, therefore, with the central-station men themselves to act. Their cause is undoubtedly just, their grievances are clamant, and they urgently need a representative body to look after their interests.

So far we have only incidentally referred to the non-professional employés, the reason being that they are in far better case than the professional men. Their needs and methods differ from those of the professional engineers; they prefer trade-union methods, and already several such unions exist for membership of which they are eligible, and which would welcome them. *Chacun à son goût;* those who fall within the "No Man's Land," as "Chief Assistant" suggests, could join which-and which would welcome them.

There is undoubtedly room in central-station service for both types of society, and there should be no question of rivalry, still less of friction, between them. It is true that there exists as sort of "No Man's Land" to which both sides may lay claim with more or less justification, but, as "Chief Assistant" remarks, it should be possible to arrive at an agreement on this point, based upon definite qualifications.

The standing of any such society, be it an association of engineers or a trade union, is necessarily dependent in a very large measure upon the character and ability of its individual members, and we would earnestly commend this fact to the attention of the organisers; if they desire to secure for their society an unblemished reputation, it is essential that they shall specify appropriate standards of education, character, and technical attainments which must be complied with by all aspirants to membership. If they open the door too widely to all comers, seeking only to increase their numbers and their income from subscriptions, they will inevitably enrol some members who will fail to do them credit, and will lower not only their reputation, but also their influence and efficiency.

With regard to the main question, so far as it affects the members of trade unions, it will be remembered that in September last the Associated Municipal Electrical Engineers (Greater London) took steps towards arriving at some measure of reform and uniformity throughout the London area. We commented upon this matter at some length in our issue of September 28th, but since then we have heard no more of it. We trust, however, that progress is being made, and that the conclusions arrived at may include some form of classification which will help towards the settlement of the dispute between the E.T.U. and the A.E.S.E.

Electricity Supply Restrictions in Germany.

It is reported from Berlin that the Imperial Coal Commissioner issued an order on November 2nd placing an immediate restriction on the consumption of electrical energy both in the case of customers of electric supply undertakings and in that of those firms or persons who possess their own generating plant. The restriction of the consumption is general, and also applies to establishments engaged on war work. The consumption is limited to 80 per cent. of that which prevailed in the corresponding month in 1916, although another period for the calculation may be accepted as the basis in special cases. If the meters are read on days other than the first day of the month, the hitherto existing reading times are to be adopted for the determination of the limitation. The Commissioner reserves the right of curtailing the consumption by more than 20 per cent. in particular cases. A preferential treatment can be meted out in respect of establishments on war work in exceptional cases.

It is held to be of special importance that consumers who have already curtailed their consumption may claim special consideration in connection with the new regulations. Consumers on a small scale are exempt from the restrictions, provided that their individual use does not exceed 250 KW.-hours per annum, but the communal authorities are permitted to fix a lower limit. New connections and extensions of existing connections can only be made on obtaining special consent, which will only be granted in urgent cases. The order provides for the appointment of honorary advisers, who will co-operate with the War Board departments and the municipal authorities, who must at once come to an agreement with the advisers concerning the limitations and the best method of arranging the distribution of energy, particularly among small consumers.

It is stipulated that consumers who receive a supply from an undertaking must pay an increase of 6d. per KW.-hour for every KW.-hour used in excess of the fixed limit. If, despite special warning, consumers do not restrict their consumption in the prescribed manner, they will be liable to imprisonment for a period of up to one year, or a fine of up to £500, or to one of these penalties. Similar regulations have been made in regard to the limitation of the use of coal gas.

As bearing upon the above question of effecting economy in the use of coal, it is stated that a daily supply of 60 trucks of coal will shortly be saved in connection with the electric lighting of Berlin, by means of a scheme which is expected to be brought into operation in January provided that the weather in the winter is not unfavourable for the completion of the work. This refers to the execution of a scheme which was brought forward prior to the war, for the erection of an overhead high-pressure transmission line between Wittenberg and Berlin, which will now be fed by the Zschornewitz-Piesteritz line, which is supplied from the Zschornewitz (lignite) power station, the generating station for works for the fixation of nitrogen. The overhead line is said to be made of aluminium-covered iron, and is being carried out by the A.E.G.

ABBOTT INSULATING CLOTHS.

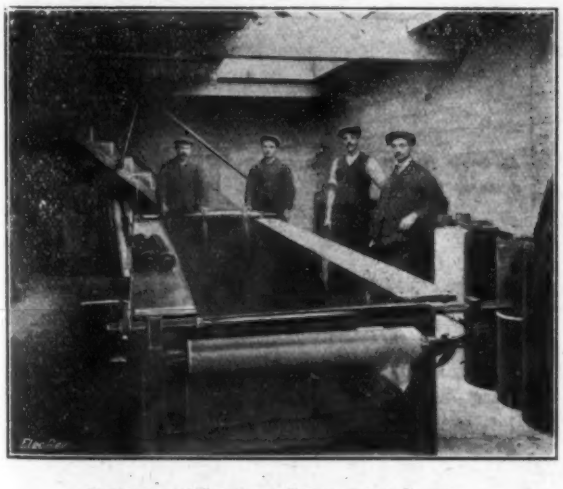
On Thursday last, through the courtesy of Messrs. Abbott, Anderson & Abbott, Ltd., of Limehouse, E., and Harpenden, whose connection with the oilskin and waterproof clothing trade goes back, we understand, to Crimean times, we were enabled to visit the Harpenden works of the firm, with a view to inspecting the modern installation which they have provided for the manufacture of the "Abbott" insulating cloths—a branch of business which the firm originally entered in 1902.

It will, of course, be within the knowledge of our readers that prior to the outbreak of war we were, in a large measure, dependent on American and Continental makers for impregnated fabrics suitable for electrical insulation, and our own Customs returns bore witness to the fact that quite a considerable import business had sprung up in these goods, of which, according to available statistics, 1½ million yards were received annually in this country—though whether that amount was used here does not appear so certain.

Cutting and Sewing Fabric.

Impregnating House.

In any case, Messrs. Abbott can meet requirements up to three-quarters of a million yards per annum in their present buildings, and with the space available could easily double this output if the trade required it. At the outset the problem confronting the firm presented difficulties of both a technical and economic character; it was, for instance, difficult to obtain the right kind of cloth for treatment, and the proper varnish for impregnating it; the design of the necessary machinery was also a matter for much thought and ingenuity.



Inspecting Finished Insulating Cloth.

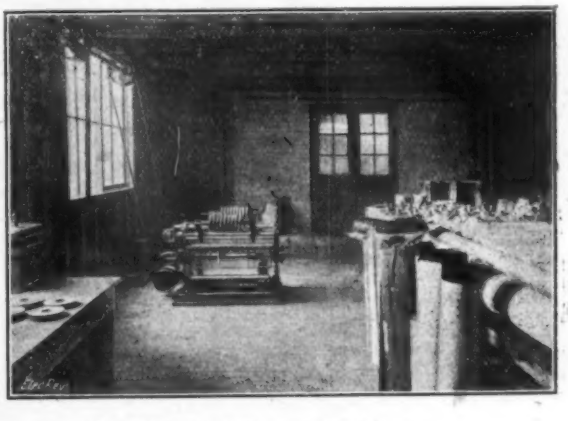
However, these difficulties were surmounted by Messrs. Abbott, and, in spite of the keen competition of imported material, they had a steadily increasing business up to 1916, when the whole of their Harpenden works was, unfortunately, destroyed by fire. The works have, however, despite the war, been rebuilt on up-to-date lines, and it was this modern plant that the members of the electrical Press were allowed to view last week. Specially woven cambric and silk are employed, and the first operation is that of cutting and re-stitching the pieces, so as to secure a diagonal lay of the warp and weft; the pieces then pass to the impregnating machines, four of which are installed in a special ferro-concrete structure several stories high, while space for two additional machines is available.

Without going into details, we may say that the fabric, after impregnation in the tanks situated in the lower portion of the building, is dried by passing it through a steam heated atmosphere, which is maintained in special chimney structures extending to the top of the building. The machine allows of successive impregnations of the same material, when desired. The material is then examined, measured and cut to the required lengths, or into tape; for shipping purposes, the ends of the rolls are impregnated with paraffin wax.

The linen fabric is supplied in thicknesses of 5 to 15 mils, and the silk in 4 to 6-mil thicknesses; both the transparent yellow and black insulations are supplied, in widths up to 38 in. and lengths of 100 yards or less.

We understand that authoritative tests on a 10-mil sample showed a maximum disruptive voltage of 11,000 volts and a minimum of 8,900 volts; moreover, Messrs. Abbott claim that their product is superior to the grades imported hitherto.

In conclusion, we need not emphasise the necessity of having a "self-contained" electrical industry in this country, especially at a time like the present. Varnished fabrics and tapes are essential for the heavy electrical machinery industry and varnished silks for the magneto and instrument trade, and it is to be hoped that Messrs. Abbott, Anderson & Abbott's enterprise in this direction will be appreciated by electrical men, not only at the moment, but in the more strenuous commercial times that lie ahead.



Insulating Tape Cutting Machine.

The Whitley Report.—Mr. F. Huth Jackson, presiding last week at a meeting of the National Alliance of Employers and Employed, said, according to the *Times*, that Mr. G. H. Roberts had declared that it was the intention of the Government to appoint a Parliamentary Committee, of which Mr. Whitley would be chairman, to consist of three members from each party of the House of Commons, which, in consultation with the National Alliance, the Industrial League, and other similar bodies, would consider the best means by which the recommendations of the Whitley Report should be carried into effect.

THE SALARIES OF CENTRAL-STATION OFFICIALS.

By G. W. STUBBINGS.

Although the bulk of the discussion regarding the subject of this article has referred to the salaries of charge engineers and switchboard attendants, there is little doubt that acute dissatisfaction is generally felt by all the members of the technical staff. A brief study of a list of the salaries paid in the principal London undertakings will convince anybody that something is wrong, and this is confirmed by the sense of grievance felt by most technical officials, it being fair to state that such officials are of a class not accustomed to grumble without sufficient cause. It is but to state a truism to say that criticism, to be useful, should be constructive, and it is the writer's belief that it is largely due to the fact that central-station officials have never proposed any rational scheme by which their salaries should be determined, and on the observance of which they could insist, that so little has been done. The difficulties in devising such a scheme are very great, both on account of the diversity in the sizes of the various undertakings, and on account of the difference in the responsibilities and scope of the work of officials in undertakings of comparable size having the same official title.

In the case of workmen it is not a difficult matter to fix on an equitable wage. A wireman, for instance, does very much the same work whether he be employed on an undertaking having an output of one or a hundred million units per annum. The responsibilities of the supervisory staff will vary with the output, and, further, the difference in the meaning attaching to some titles in various undertakings introduces a further complication. This difference is most marked in the case of the distribution sections of electricity undertakings. A comparison of the outputs of two undertakings, A and B, will give no certain indication of the duties and responsibilities of the two mains superintendents. At A this official may be nothing more than a mains foreman, the more difficult work being looked after by the chief assistant; while at B the mains superintendent, besides having complete charge of the mains, may be also responsible for the testing, public lighting, and tramways overhead sections. The problem, then, of devising a rational basis for the calculation of salaries is by no means easy.

The first principle to be suggested in this attempt to solve the problem, is that a man's salary should bear some definite relationship to his responsibilities. This is incontrovertible. The simplest application of this principle would be a rule by which the salary would be directly proportional to the responsibility. This is hardly equitable, as placing the small man at a great disadvantage. The second principle that occurs to the writer will obviate this defect. This principle may be briefly described as that of a minimum salary which represents a return for a man's general training and fitness, apart from his responsibilities. The algebraical expression for the salary attaching to a particular post will now be: of the form—$y = a + b\,x$, y being the salary, x the responsibility, a the minimum wage, and b a constant to be decided upon.

The constant a should be equal to an amount sufficient to cover the bare necessities of living, as most people will concede that a man who is working is, by reason of his working, entitled to this. It is worthy of discussion as to whether this constant should be different in the case of a married man from that of one who is single.

The term x, representing responsibility, is a difficult one to fix. It must obviously be represented by some easily determinable quantity. Such quantity will, however, be different for each official. For the works superintendent the plant capacity is a good indication of the scope of responsibility; but this would be almost irrelevant in the case of the chief clerk, when the number of consumers would be a fitting criterion. The variable part of the formula will, in the case of the mains engineer, include a number of terms according to his responsibilities; one, for example, for his mains work, another for public lighting work, and so on. Mathematically, the complete equation will be: $y = a + \Sigma\, b\, x$.

The writer suggests the following criteria for determining the responsibilities of the various officials. The particular number in each case, whether KW. capacity or number of consumers will be x in the formula.

Works Superintendent ...	Plant capacity.
Charge Engineer	Maximum load.
Draughtsman	Plant capacity. Miles of cable.
Chief Clerk	Number of consumers.

The value of b would vary according to whether or no the rendering and collecting of consumers' accounts were undertaken by the office.

Meter Superintendent ...	Number of meters.
Commercial Assistant ...	Population of the area of supply.
Mains Superintendent ...	Miles of cable. Number of meters. Number of public lamps. Miles of overhead tramway equipment.

Only those items applicable to the particular case being included. In cases where considerable mains extensions are carried out by the mains engineer, he should be paid a percentage on the cost of the job.

When an undertaking reaches a moderate size the problem is complicated by the fact that assistant supervising officials are employed. The responsibility of the chief official will then largely depend upon the ability of his assistant. A man with an assistant who is capable of looking after any section of the work in his absence, has far less worry and anxiety than one who has an assistant confident to carry out routine work of minor responsibility only. The most equitable way out of this difficulty seems to be to calculate the total salary to be paid to the department, the formula being in this case $y = na + bx$, n being equal to the number of officials. Having fixed the total salary, the apportionment of the same can be made by the chief engineer of the undertaking concerned, who would have an intimate knowledge of the capabilities of the officials concerned.

The matter dealt with in this article is a very difficult one, and the writer is well aware that his suggestions may be faulty in many respects. As no previous attempt of the kind appears to have been made, these suggestions may serve as a start. The dissatisfaction of central station officials is certainly not without good cause; but all must remember that to obtain redress it is not sufficient to be dissatisfied, or even to express dissatisfaction. It is necessary to know with certainty what one requires. A set of requirements calculated on some such rational basis as suggested in this article would, in the writer's opinion, be of great assistance and carry great weight. It is hoped that the scheme outlined above, although hastily considered, may assist central station officials in formulating definite requirements.

£100,000,000 a year from State Power.—Speaking at the Aldwych Club recently, Mr. H. Wilson-Fox, M.P., honorary secretary of the Empire Resources Development Committee, stated that the National Debt after the war would probably amount to £6,000,000,000, necessitating an annual revenue of at least £600,000,000. The policy advocated by the Empire Resources Development Committee was the development under State auspices of some of the resources and opportunities of the Empire, under conditions which would give to the State a direct financial interest in the results. The wastage in our power supply was almost incredible. Ten years ago the Witwatersrand goldfields were equipped with the best individual steam-power plants that money could command, and coal was available near by at from 2s. 6d. to 5s. a ton; yet, by the introduction of a central power system a saving of £3,500,000 had been effected in the working of the mines themselves; which saving, added to the sum of £500,000 paid by the Power Co. in dividends and interest on debentures, meant that on the original outlay of £7,000,000 there had been a total return to all concerned of upwards of £4,000,000 per annum, and that without utilising by-products.

In 1907 the total engine capacity in this country was estimated at 10,587,870 H.P., of which about 2,500,000 H.P. was employed in the production of electrical energy. If a considerable proportion of this equipment were centralised, and care were taken to make a profit from by-products, as well as from the sale of power, the State could derive a profit of at least £100,000,000 per annum, while considerably reducing the cost to the consumer.—*Financier.*

DOMESTIC ELECTRIC HEATING PROBLEMS.

(*Concluded from page* 478.)

Heater Comparisons.—A booklet, published by the Hotpoint Co., who are, of course, strong advocates of the open-coil (or so-called "red-hot") type of heater, contains the results of various tests on these and disk-type hot-plates.

The company's Reflex open-type heater (in which a reflector assists in concentrating the heat rays on the bottom of the utensil), a moulded block open-coil type heater and a disk-type heater, each of 1,000 watts loading, were used, and the curves, fig. 4, were obtained on the basis of raising the temperature of one quart of water from 70 to 210° F. starting from cold.

These show the superior efficiency of the Reflex heater for short boiling periods with average utensils; further tests in comparison with gas gave the following results:—

—	Reflex.		Block.		Disk.		Gas.	
Dish—	Time, min.	Eff., p.c.	Time, min.	Eff., p.c.	Time, min.	Eff., p.c.	Time, min.	Eff., p.c.
Enamelled	15'14	45'4	18'95	36'3	26'6	38'7	14	34'2
Aluminium	16'12	42'6	20'12	34'2	24'36	42'3	13'25	35'8

The test was made by raising two quarts of water from 70 to 210° F. with a covered utensil, starting from cold; the heater capacities were:—Reflex, 1,500 watts; block, 1,500 watts; disk, 1,000 watts; and a "standard medium-sized gas burner operated with a maximum flame."

Some independent tests carried out by an Indian contemporary on the Reflex heater and a popular type of English hot-plate are of interest. In this case a special block-tin copper-bottomed kettle was provided for the hot-plate or disk-type heater, also an ordinary enamelled kettle, and both were used on each type of heater. The Reflex heater was of 600, and the disk stove of 800 watts capacity; the tests were made with one quart of water at an altitude of 8,000 ft., where the boiling point is, roughly, 197° F.

The results were as follows:—

	Disk stove.				Reflex.			
Test No.	Units.	Temperature rise deg. F.	Time in minutes.	Efficiency per cent.	Units.	Temperature rise deg. F.	Time in minutes.	Efficiency per cent.
1	0·292	131·5	20·23	32·69	0·163	137	14·82	61·02
	Starting from cold with enamelled kettle.							
2	0·2546	135·5	17·42	38·64	0·1874	134	17·02	51·91
	Starting from cold with disk stove kettle.							
3	0·166	137	10·53	59·92	0·1470	139	—	68·65
	Starting from hot with enamelled kettle.							
4	0·1266	137	8·93	78·56	0·1796	136	15·97	54·98
	Starting from hot with disk stove kettle.							
5		148 191	◄ Current switched off at ► 148 ◄ Temperature rose to ► 156 in 10 in 1·8					
	Stored heat test.							
6	0·185	130	23·81	51·02	—	—	—	—
	Maximum efficiency test for disk stove from cold, with kettle belonging to disk stove.							

In test No. 5 the water was raised to a certain temperature current being then switched off and the further rise in temperature noted till the latter became stationary. Test No. 6 was intended to ascertain the maximum efficiency in use by an experienced person who could judge when to switch off, so as to economise to the practicable limit.

The tests clearly indicate the high efficiency of the Reflex type of heater for intermittent use, and especially with ordinary utensils, but where cooking is carried out on a large scale and the range is in continuous use, the disk type of heater with its special utensils attains a very high efficiency.

Domestic Electric Cooking Costs.—Some data recently published by the Ontario Hydro-Electric Power Commission on energy consumption for domestic cooking, of groups of consumers in Ontario towns, is of considerable interest.

The consumers are divided according to size of family and the monthly energy consumption and bills, both prior to and after the installation of electric cooking are given.

For London (Ont.) data for 252 families is given, and we note that the monthly range consumption increases, roughly, in proportion to size of family from 119 KW.-hours for two people to 256 KW.-hours for nine people; also the monthly range bill similarly increases proportionally from $1·15 to $2·38 and the range cost per month per person decreases proportionally from $·58 to $·26. The installed range capacity varies from 5·13 to 6·5 KW. per family.

The London (Ont.) tariff is 3 cents per 100 sq. ft. of floor area plus a primary meter rate (3 cents) per KW.-hour for the first three

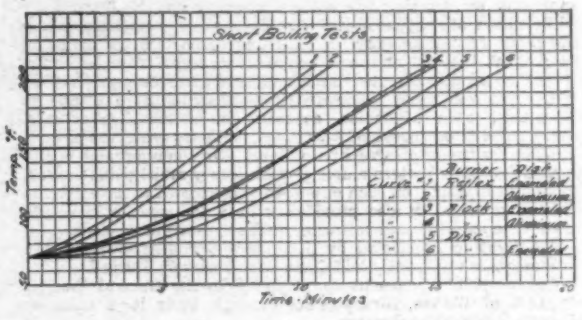


FIG. 4.

—	Reflex.		Block.		Disk.	
Dish—	Time, min.	Eff., p.c.	Time, min.	Eff., p.c.	Time, min.	Eff., p.c.
Enamelled	10·56	48·8	14·83	34·7	17·75	29·0
Aluminium	11·2	46·0	15·0	34·3	16·0	32·3

KW.-hours per month per 100 sq. ft. floor area, plus a secondary rate (1 cent) for excess consumption. Taking the average of all the London (Ont.) cooking consumers, the use of the range has increased their energy consumption, roughly, five times (39 KW.-hours to 200 KW.-hours per consumer per month) and their electricity bills by two and a-half times ($1·09 to $2·67 per month).

In St. Thomas, where similar rates obtain, averaging all consumers the monthly consumption per consumer has increased from 44 KW.-hours to 207 KW.-hours, and their electricity bills from $1·24 to $2·78, while in Windsor, where a higher rate is charged, the energy consumption with the range in use is five times as great and the bills 2·7 times as great.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

Sub-Station for the Co-operative Wholesale Society.

For the purpose of converting the 400-volt continuous-current supply of the Manchester Corporation to the requirements of its central premises and warehouses in Manchester, the Co-operative Wholesale Society has laid down a neat and attractive looking

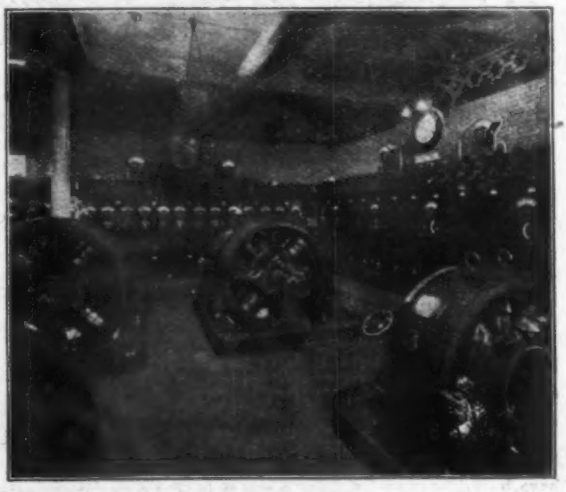


FIG. 1.—THE SUB-STATION OF THE CO-OPERATIVE WHOLESALE SOCIETY AT ITS CENTRAL PREMISES, MANCHESTER.

sub-station containing the necessary converting machinery and distributing switchboard; power from this sub-station is utilised for driving lifts, hoists, &c., and for lighting.

D

The contract for the plant was placed with the General Electric Co., and includes four 90-kw. motors for driving existing generators, two 63-kw. motor-generators, and one 47·5-kw. motor for driving an existing generator. These sets run respectively at speeds of 410, 600 and 300 r.p.m., the motors and generators being mounted on combination bedplates.

The switchboard is arranged in two portions at right angles to each other; one portion devoted to the control of the motor-generators consists of eight panels, seven for the machines and one for the incoming supply. Each panel accommodates the necessary apparatus for starting the motors mounted on the lower slab, while above are the necessary circuit-breakers, ammeters, relays and shunt regulating gear. Paralleling voltmeters are carried on brackets at the end of the board, while on a pediment on the top of the board are mounted an illuminated dial sector pattern ammeter and voltmeter. The distribution switchboard comprises 16 panels, each of which controls six distributing circuits. Every panel is composed of two slabs, both carrying the circuit-breakers for the respective three circuits. On the upper slab is also mounted a sector pattern ammeter with rotary multi-point switch, enabling the shunts on each circuit to be connected to the ammeter. This switchboard is also provided with a pediment, including a sector type ammeter and voltmeter, and a non-magnetic clock.

The lighting is effected by G.E.C. semi-direct fittings, and the sub-station is very neatly laid down and effectively finished.

The complete equipment was supplied by the General Electric Co., Ltd., of Witton, Birmingham, through their local office at Victoria Bridge, Manchester.

Indebtedness is expressed to the Co-operative Wholesale Society, Ltd., for permission to take the accompanying illustration, and to publish these remarks.

Husband Oil-Engine Sets.

Our view, fig. 2, shows one of the new "valveless" oil engines with cooling water tank, &c., mounted on a truck as portable unit, and supplied by Messrs. F. Husband, Ltd., of Craven House, Kingsway, W.C. 2. The engine is of the two-stroke cycle type, and its design, though having special features, is along the simple lines associated with that type of engine, the valve gear of the

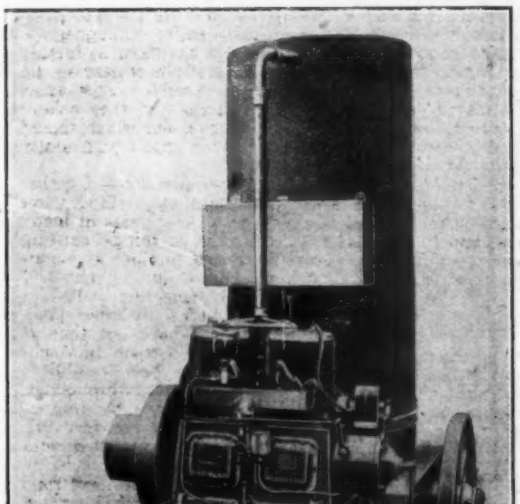


Fig. 2.—Husband Portable Oil-Engine Set.

four-cycle type of engine being dispensed with. The engine is, however, claimed to be much more efficient than the ordinary two-cycle engine; a positive system of lubrication is fitted, and high-tension magneto ignition, the magneto being mounted on the governor case. The engine is fitted with a flywheel pulley, and is suitable for driving a dynamo, pump, or other machinery.

New Transformers.

Messrs. Johnson & Phillips, Ltd., of Charlton, London, S.E., have brought out an ingenious portable testing transformer, provided with hoops, as shown in fig. 3, which enable it to be rolled along the floor of the workshop or test-room to the place where it is to be used. The device may be open (as illustrated) or protected, or totally enclosed, and is made in sizes up to 25 k.v.a., and 6,600 volts, single or three-phase.

Another useful novelty is the application of the transformer principle to the heating of shell bands, as shown in fig. 4. This has the advantages that it can be placed in any convenient position, heats the rings uniformly and without producing scale or burning the bands, is free from smoke, flame, and fumes, and is safe from

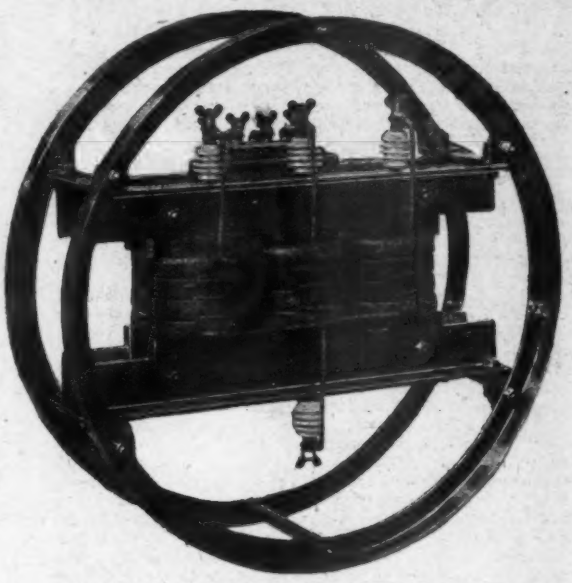


Fig. 3.—J. & P. Portable Testing Transformer.

fire risk. It is easy to manipulate, the arm being counterpoised, so that it can be raised to slip the band into place; the heating takes from 1 to 4½ minutes, according to the size of the band, and

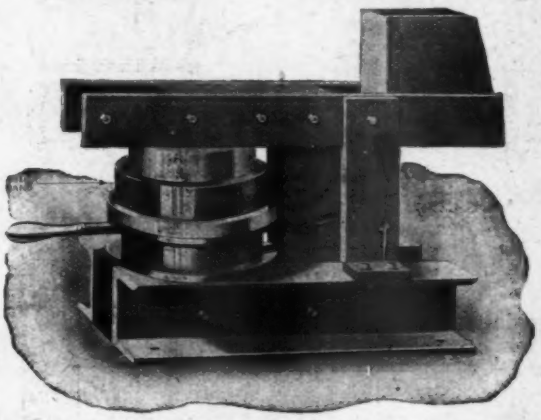


Fig. 4.—J. & P. Shell-Band Heating Transformer.

from 200 to 400 bands can be dealt with per day. It is wound for any standard frequency and any voltage up to 550 volts. A similar type is being developed for heating steel tires and shrink rings generally.

A New High-Frequency Induction Furnace.

An interesting development in small electric furnaces has been made by Dr. E. F. Northrup, of Princeton University, in conjunction with the Pyrolectric Instrument Co., of Trenton, N.J., and under the direction of the Ajax Metal Co., of Philadelphia, Pa.

The furnace uses oscillatory currents for the generation of heat. By the use of a highly effective induction, currents can be set up in the containing crucible in the case of a non-conducting melt, or in the melt itself, if the same has sufficient conductance. It is possible to raise the temperature of a melt in a crucible until its resistance becomes low enough to permit the generation of heat in the substance itself (as in the case of melting glass), after which the temperature producible is limited only by the durability of the insulation and container.

The furnace is especially suitable for alloy research at temperatures above 1,400° C., inasmuch as it makes possible the running of melts in vacuo or in any atmosphere desired, particularly in one free from carbon. With a 20-kw. furnace, which is the largest size so far built, a temperature of 1,620° C. has been easily attained. Theoretically, there is no temperature limit, but practically there is a limit because of the necessity for proper heat-insulation between the containing crucible and the outside coil.

What is actually accomplished is to induce countless eddy currents in the melt itself, provided it is a conducting substance, by the use of oscillating current at a frequency of about 12,000 cycles. If the melt is of a non-conducting substance, such as glass, a conducting crucible such as graphite is used. Eddy currents are then induced in the crucible, which in turn heats the

glass, rendering it conducting as it rises in temperature, after which eddy currents are set up in the glass itself.—*Met. and Chem. Eng.*

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

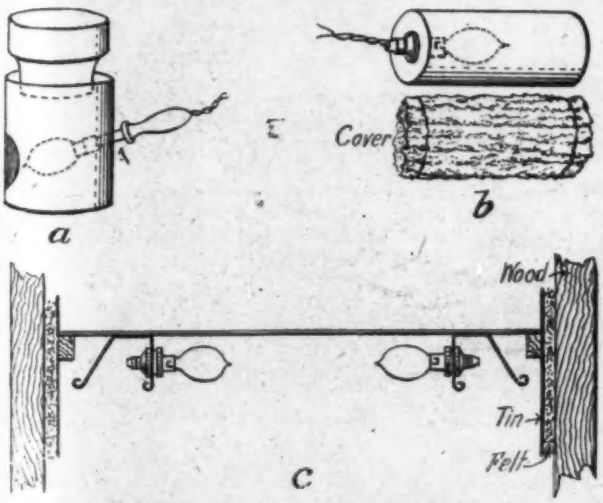
A Portable Electric Lamp Cooking Box.

I am very pleased to see that Mr. Edwards is having a try at the most sensible type of cooking apparatus yet made, and I sincerely wish him success. At the same time, I would ask him to reserve a good share of his ingenuity to use in persuading people to see the good points in his apparatus.

One of the most energetic and prominent advocates of cooking by electricity once told me that any man who wanted people to buy his cookers would make them to look as much like gas cookers as possible if he wasn't a —— fool; and I found he was quite right. Gas ovens and electric ovens are so much alike that they can easily be mistaken the one for the other; moreover, to a large extent, they are both made in the same workshops.

Some years ago I made several pieces of apparatus, using lamps as heaters; one was a food warmer for use in the nursery. This was a straight-walled tin pan with a wooden handle, through which the flex wire passed to a S.B.C. holder and a 5-C.P. Ediswan No. 3 lamp, see fig. *a*. In the side of the pan was a round hole about 1 in. diameter, having a mica window; this enabled the apparatus to do duty as a night light. In the top of the tin pan a porcelain cup with a "well" was fitted, and a cover over this completed the apparatus. I succeeded in keeping only one of those in sight; it completed its duties in the nursery, and was afterwards used by an elderly Lady—(capital L)—for several years.

Another was a foot warmer for use in bed. This consisted of a round straight tin about 9 in. long and 3 in. in diameter, with the



usual slip-on lid. A 1¼-in. hole was cut in the bottom, and a Belsize lampholder was used—held in position by the shade carrier ring; a flannel cover, with a tape run in a slot at each end, and drawn up after being slipped over the tin, and an 8-C.P. lamp completed this apparatus, fig. *b*.

This caused trouble, as it was found impossible to convince people that an 8-C.P. lamp was the largest power that should be used; consequently, 16's were used, and scorched sheets resulted. To get over this, three-prong lamps and holders were used; then the lamps were difficult to get.

Another was a wooden hot-cupboard with a tin lining packed with felt, about 20 in. × 20 in. and 24 in. high; the heater was a shelf like a meat tin turned upside down and eight lamps of 16 C.P. were used, fitted inside the tin, fig. *c*. This produced very uniform heating, being a radiator for the lower half and a convector for the upper half. When the air-tight door was kept closed, the heat melted the solder out of the joints of the tin lining in one instance.

There were other things on the same lines, but none of them had the remotest resemblance to gas apparatus, and I found that the description of people who didn't make their apparatus look like gas things fitted me rather too well. Better luck to Mr. Edwards.

J. Jackson.

Harrow, *November 12th*, 1917.

The Association Movement.

Mr. Atkinson's letter in your last issue is not satisfactory. In his letter to you of October 18th he made the following statement:—

"From inquiries made since Mr. Berry's article appeared it would seem that he certainly had the idea to found a trade organisation, and took some steps in that direction, but these came to nothing."

In his letter of November 4th he says:—

"I am authorised to state that, in the opinion of those present, my letter of October 18th correctly sets out the position."

I regret to have to state plainly, but firmly, that that statement, now persisted in, is untrue, and I propose to prove it. I agree the matter is one which is probably of little interest to the majority of your readers, but Mr. Atkinson, by an ingenious dislocation of the facts as they occurred, has contrived to discredit some of my statements. That is a situation I cannot tolerate for a moment.

Without vouchsafing any proof, Mr. Atkinson fires a parting shot wide of the mark, and, adopting the tactics familiar to us, endeavours to obscure the issue by a cloud of generalities; in effect he says:—"As far as I am concerned, I now propose to disappear in the fog." That self-effacement, however, cannot be permitted without protest.

The proper course for the Association to pursue, in my opinion, was to accede to a request I have lodged for an impartial investigation. That course they have decided not to adopt. The reason is obvious: they have no case. I have, however, already said that Mr. Atkinson has not adhered to the facts. I now propose to produce the evidence to prove it.

The following letter, of which the enclosed is a copy, has been carefully kept by Messrs. Siemens Bros. & Co., and sent to me by Mr. J. J. Easton. It was written by me on December 9th, 1898. The Cable Makers' Association have been duly furnished with a copy. It reads:—

(*Copy.*)

"The Arts Club, Manchester.
December 9th, 1898.

"DEAR MR. EASTON,—With reference to my conversation with you on Monday and Tuesday last, I have independently visited the two largest manufacturing firms in the North of England to ascertain their views on the subject of our discussion, and I found them most ready to enter into the question. Both firms have expressed their entire willingness to support any concerted steps which may be taken to further an object which they consider it is absolutely necessary should be brought about with as little delay as possible. They agree that the matter is one of vast importance, and they believe it is possible to constitute a combined movement which should be a lasting benefit to the comparatively small community whose interests are so much at stake.

"In the present state of the raw material market, I gather that these manufacturers are, as you surmised, selling wires and cables at the present moment *below* cost price in many instances, and they consider such a state of things, existing in an enormous industry where the actual number of manufacturers is so limited, to be highly disastrous. I may add that they would be willing to attend a meeting, called in London or elsewhere, immediately, to discuss the most practical way of dealing with the difficulty. I have not time at present to send you any further information upon this subject, but I should like to add that I have been careful to suppress Messrs. Siemens Bros. & Co.'s name throughout, except to say, as you suggested, that I was *under the impression* that you were as anxious as they were to consider this matter. I would further remark that I have consulted with principals only upon each occasion, and they sufficiently realised the gravity of the question to suggest the most rigid secrecy, and the inadvisability of sending any official written communication whatever about this matter until such time that it would be safe to do so. I should like if possible to have an opportunity of talking this matter over with you and Mr. Siemens, and I would suggest Monday, at 11 o'clock, if convenient. I will call then unless I hear from you to the contrary. Meanwhile, believe me, yours faithfully,

(*Signed*) HERBERT BERRY."

One of the principals referred to in that letter was Mr. Taylor, of Helsby, who discussed with me an earlier effort he had been interested in, and to which I shall refer later. He agreed to attend the meeting to be called in London, or elsewhere. Shortly after that, the other conferences took place to which I have already referred, and finally I laid my plans, for the first time, before Mr. Henry Edmunds, then chairman of Messrs. Glovers, Ltd. Almost immediately afterwards the suggested meeting took place.

It was agreed that Mr. Edmunds should complete the arrangements, and he was elected to the chair. I am not concerned with Mr. Edmunds's subsequent constructive proposals; I have never claimed any interest in them. They may, or may not, have differed from the proposals which figured at the first, but by then defunct, Cable Makers' Association. It can be assumed with certainty that the proceedings were ably conducted.

My whole point is that I conceived the idea to found the second Cable Makers' Association. I did the spade work, and obtained the consent of the principal parties concerned to attend a meeting in London, and they did so. If that is not laying the foundation stone, then perhaps Mr. Atkinson will tell us what is.

The point, however, which I now wish to clear up is Mr. Atkinson's statement, which I here repeat:—

"From inquiries made since Mr. Berry's article appeared, it would seem that he certainly had the idea to found (*a*) trade organisation, and took some steps in that direction, but these *came to nothing*."

Let there be no mistake about that remark, because Mr. Atkinson now says:—"He is authorised to say that he has correctly set out the position." I say definitely that it was the first Cable Makers' Association which *came to nothing*. I had nothing whatever to do with that. It was, as a matter of fact, inspired by Mr. Henry Edmunds and others. I have reason to know it, because he told me so at my interview. Every old-established wiring contractor, and there are hundreds of them, remembers the first C.M.A. It flourished for a short while, but suffered a premature death. Does Mr. Atkinson propose to deny that? If so, let him come forward and furnish dates.

It was remarked to me by a member a few years ago that the existence of the Association had probably meant at that time an increase to the members' joint coffers amounting to a million pounds sterling. If that figure was not over-estimated, it will be a matter of small surprise that the credit for the origin of the second Cable Makers' Association is much coveted, especially by those who, figuratively speaking, are wallowing in their accumulated wealth.

I admit that it must be galling for the Association to be called upon to apportion the credit according to its due, when by so doing it involves including someone situated outside the charmed circle; but surely that course would have been more dignified and sportsmanlike.

With regard to Lieutenant Paterson's letter, I am quite content with his statement that, so far as Messrs. Johnson and Phillips's Cable Works are concerned, it is a fact that he was first approached by me. If Mr. Atkinson gets comfort out of the fact that, in spite of that, Mr. Edmunds was referred to often as the "father," he is welcome to it.

In conclusion, I would add that, in carefully chronicling the genesis of the second C.M.A. in so far as my share of it is concerned, I was completely unconscious of the fact that, in so doing, I was shaking the foundation of a Golden Image which Nebuchadnezzar, their King, had set up.

Herbert H. Berry.

London, W. 1, *November 19th*, 1917.

The E.T.U. or the A.E.S.E.?

The station engineers are at last waking up to the benefits to be obtained by united action, yet they are straightway making the serious mistake of dividing into two camps.

Let the members of both organisations bridge the split at the outset, or else examine impartially the policy of both, and join the one that is the stronger to obtain what we want, *i.e.*, more pay and better conditions of employment.

E. T. U. Ease.

Up to recently (I have read your paper for the past 25 years) the "Correspondence" columns of the REVIEW were invariably sought after for information, and were considered to be edifying and beneficial. The correspondence in your present issue with reference to the exploits of the E.T.U. is hardly so, however. I am not myself interested in any trade union or society, and personally have not the pleasure of knowing Mr. Napier, but whatever good is served by publishing the aimless generalities of W. J. Webb, or the senseless drivel of H. H. Morton (who, with all his sneers, does not deny any statement made by Mr. Napier) I fail to see. In the past, when correspondents lapsed into slang and personalities a small footnote invariably appeared somewhat to this effect, viz.:—"This correspondence must now close," and I think your paper would be considered to be the cleaner if this were done now.

X.Y.Z.

[None know better than Editors that it is impossible to please everybody; on the other hand, the public ventilation of such questions as the subject of this correspondence is a duty which must be fulfilled, and in performing it we have endeavoured to be scrupulously fair to all parties, at the cost of space which, we must admit, we have grudged. As regards the ban on slang and personalities (which are not wholly absent from "X.Y.Z.'s" letter), it is evident that our critic has overlooked the "small footnote" which appeared on p. 467 of our last issue.

In justice to ourselves, we must point out that the fundamental question which underlies this correspondence—namely, the method by which the staffs of electricity supply undertakings, from the chief to the humblest employé, shall obtain the adequate remuneration for their services to which they are justly entitled—is one which is of absorbing interest to some thousands of men; there may be many, like "X.Y.Z.," who are not concerned with this subject, but we trust that, in the interests of their fellows, they will exercise a generous patience for a time. The matter has now apparently come to a head, and in our leading columns to-day we comment on it.—EDS. ELEC. REV.]

An Electricity Supply Engineers' Association.

It is to be regretted that your valuable pages are occupied weekly by letters relating to the contest between the E.T.U. and the A.E.S.E., and the excuse for adding one more to the number is the hope that it will tend towards a settlement, not only of this small issue, but some matters which are perturbing the minds of electricity supply engineers generally at the present time.

It is admitted there are capable men in both the E.T.U. and the A.E.S.E., and they ought to get together and determine as regards their members where the E.T.U. finishes and the A.E.S.E. begins. If that is difficult, they could leave the junior charge engineers as a sort of "No Man's Land," and let them decide for themselves which they will join, as it appears to be there where the most divided opinion exists. As the parties are going on at present, both sides are wasting a lot of time and money without any good results."

The root cause of the trouble is the increase in the cost of living, and the inability to exist on the salaries which were too low even in peace-time, and the reluctance of the authorities to grant justified increases. This has resulted in the juniors, and, in fact, some seniors, being anxious to obtain the increase of wages awards which were primarily intended for workmen. The awards are more easily obtained through trade unions, but the professional engineer does not like the idea of joining a trade union, and quite right, too; but how can he obtain his due otherwise, as there does not exist at present a professional association that can assist him?

The A.E.S.E. has taken up the case for the juniors, and a few seniors have thrown in their lot with them, but they are so few that the Association could not put in a plea for the seniors. An attempt, therefore, is being made to obtain more senior members for that Association, but it appears to be starting from the wrong end for a junior association to be setting about organising the seniors, and therefore very little support is expected.

What else, then, have we got? There is the Chief Technical Assistants' Association for municipal seniors, but I believe there are a few of those who are not in the Society. As for the company seniors, they do not appear to have an association at all, and there are separate associations for company and municipal chief engineers. Now, so far as I know, all these associations were formed ostensibly for the purpose of interchange of technical and administrative knowledge, and not one offers assistance in the question of remuneration.

This is the paramount question to-day, as it is difficult to make ends meet on the old salaries, and when the engineers are working strenuously, as, of course, they should be in these times, they feel the differences in remuneration existing for similar posts in stations of the same capacity, and the matter ought to be put right without delay.

The Institution of Electrical Engineers, which comprises all the grades, is purely a scientific society, and it should remain so, far above commercialism. What we need, then, is a comprehensive association for all professional electricity supply engineers in the Kingdom (chief engineer to junior inclusive), solely for dealing with questions of professional status, remuneration, and matters of common interest, and able to make its presence felt if need be. This should be quite distinct from the existing technical associations, and should have an executive committee, consisting of chiefs, seniors, and juniors, meeting, say, monthly, or oftener if need be, and an annual general meeting.

Will our chief engineers, company and municipal, London and provincial, get together in our mutual interests and arrange a meeting, say at Westminster, to thoroughly discuss the question, and invite our I.E.E. President, Mr. Wordingham, to kindly consent to take the chair? I feel sure they would find the time would not be wasted.

Chief Assistant.

The Teaching of Electrical Installation Work.

In view of the adverse criticism of the tuition given to students desirous of acquiring knowledge of electrical installation work, it occurs to me that some of your readers may be interested in the Wireman's Class at the Trades Training Schools, Great Titchfield Street.

This is probably the best equipped and best attended class of its kind in the London district, and numbers among the students not only boys and improvers, but men of mature years anxious to improve their knowledge of this class of work.

A full complement of tools has been provided, with ample material, and, furthermore, to enable power work to be taught, a small but complete electrical factory equipment has been purchased, and is being installed by the students this session.

If anyone interested in the subject is inclined to visit the schools on class nights, Monday, Wednesday, or Friday, I shall be pleased to show him the facilities we have at hand for teaching this important subject.

S. Nichols,
Instructor.

London, W., *November 19th*, 1917.

AN INSTITUTION OF ELECTRICITY SUPPLY ENGINEERS.

A conference of senior technical officers drawn from company and municipal electricity supply authorities of the London area was held at the Hammersmith Electricity Works on the evening of Thursday, 15th inst. The meeting was convened by the Executive Reconstruction Committee of the Association of Electrical (Station) Engineers of London.

The chair was taken by Mr. F. Hill, chief assistant electrical engineer to the Hammersmith Borough Council, who, in his opening remarks, briefly stated the objects of the conference. No one who had followed recent developments could doubt the necessity for concerted action on the part of central-station engineers, and it was proposed to place the true facts of the situation before that meeting in order that they might be in a position to judge of that necessity. He called upon Mr. H. W. Healy, President of the London Committee of the A.E.S.E., to outline the history of the Association movement and the recent developments.

Mr. Healy first expressed the thanks of himself and those of the junior men associated with him to Mr. G. G. Bell, the chief engineer and manager of the Hammersmith electricity works, for the encouragement of his practical interest in their efforts. After dealing with the early history of the A.E.S.E. and its development to date, he gave a detailed report of the action taken by the junior staffs of the London power stations to ensure that their interests were not represented by outside bodies. Steps had been taken to get together a representative committee of six men to prepare schemes of reconstruction, and with that end in view they had issued invitations to the senior technical officers. It did not appear beyond the range of practical politics to agree upon definite lines of concerted action which would place all questions affecting the financial interests of central-station engineers, from chief to junior, above the level of barter. On the broad questions —standard of efficiency, status of the profession, and adequate remuneration—there was no division of opinion. On those matters the interests of seniors and juniors were common. The existing associations did not, as at present constituted, meet the needs of the case, and he would suggest as a basis of discussion that perhaps a new body could be formed to deal with these broad questions, leaving the existing associations to develop until the time was ripe for them all to be embraced.

In the discussion which followed, Mr. A. P. MacAlister (Islington), speaking from considerable past experience of organisation of associations, emphasised the difficulties of securing co-operation between seniors and juniors, and held that it was not always possible for company and municipal engineers to meet for mutual discussion. He had many times suggested to the senior men of the company undertakings that they should form an association. He suggested that a solution of the difficulties could be found in affiliating the sectional associations.

Mr. F. D. Napier (North Met. E.S. Co.) reviewed the remarks of the previous speakers, and expressed himself as in entire agreement with the necessity for concerted action. If that course were followed, all questions affecting the interests of any grade could be settled by constitutional procedure. He then moved the following resolution :—

"That this Conference of Senior Technical Assistants appoint a committee of nine to confer with the existing Association of Electrical Station Engineers' Committee on the questions of construction and reconstruction. The representatives appointed to be three from the companies' staffs, three from the C.T.A.A., three from municipal staffs. The recommendations of the combined committee to be placed before a general meeting to be called in due course."

Mr. H. F. J. Thompson (chief assistant engineer, Battersea) moved a resolution in similar terms, subsequently seconding the original resolution. Speaking from a lengthy experience in the service of both company and municipal supply authorities, he could not see where the staff interests clashed, although it was quite possible that there might be something in the suggestion. He endorsed the remarks of previous speakers regarding the need of a comprehensive association.

Mr. W. Young (chief assistant engineer, Stepney) supported the suggestion, and pointed to the work done by the C.T.A.A. It had been formed for academic purposes, and had undoubtedly achieved excellent results.

The resolution was then put to the meeting and carried unanimously. Nominations followed, and a provisional committee was elected as under :—

Mr. C. O. Grimshaw, Westminster E.S. Co.; Mr. F. D. Napier, North Met. E.S. Co.; Mr. W. E. A. Roland, St. James's and Pall Mall E.L. Co.; Mr. A. P. MacAlister, Islington; Mr. H. F. J. Thompson, Battersea; Mr. W. Young, Stepney; Mr. Gattril, Finchley; Mr. F. Hill, Hammersmith; Mr. G. C. Law, Barnes. Mr. H. W. Healy (Battersea) was elected hon. secretary.

It was resolved that the hon. secretary be instructed to approach the Associations of London Company and Municipal Chief Engineers, inviting them to appoint three representatives from each association to meet the provisional committee.

The meeting closed with a hearty vote of thanks to the chairman, Mr. F. Hill.

No fewer than 75 station engineers (senior technical officers) were present; never in the history of central stations has there been so representative a gathering. From the course of events, it would appear that the time may not be far distant when an Institution of Electricity Supply Engineers will be an accomplished fact.

WAR ITEMS.

Exports to China.—The "London Gazette" for November 20th contains names of further persons and bodies in China to whom exports may be consigned.

Railways After the War.—Last week, Sir A. Stanley stated that the Board of Trade, in consultation with the Ministry of Reconstruction, was giving close attention to the problems that would arise when the present war control of railways ceased. The Board was being advised by a number of gentlemen possessing expert knowledge or experience, but they did not constitute a formal committee, and there were therefore no terms of reference.

British Homesteads.—The staff and workmen of Messrs. Thomas Firth & Sons, Ltd., have subscribed £25 to the British Homestead Association in response to an appeal in the Northern Press. As this is regarded as an indication that those employed in the other great engineering works throughout the country are likely to be equally interested in the movement, we are asked by the President (the Hon. Mrs. Murray) of the Association, whose offices are at 47a, Portland Place, London, W. 1, to state its objects. The work which it has set itself to do is to look after discharged officers and men of all His Majesty's Services whose state of health may not be such that they may reasonably expect to follow their calling directly they are discharged, and to provide them with comfortable homes and an opportunity of healthy exercise on the land, so that they may fit themselves either for work on the land in some form or other, such as smallholdings, or for some handicraft, trade, or profession. Up to the present time two homesteads have been acquired, one at Congleton, in Cheshire, called the David Little Memorial, and the other near Bexley, in Kent, known as the Kinnison Memorial. Although the State grant of 27s. to men who are being trained in an approved scheme is sufficient to keep them, it does not give a man facilities for getting the best kind of training possible, such as they deserve. Nor is it likely always to give them opportunity for complete development of their powers. We commend this very worthy movement to the interest of readers who may be able to contribute to the funds, and so help to set up in life again those who have sacrificed so much.

Exemption Applications.—The case mentioned last week as being before the Hants Appeal Court (the Military appeal against exemption given to a young man of 18) was incorrectly stated. We understand that no such appeal has been made in respect of the Winchester Corporation electricity department, and that there is no assistant aged 18 on the staff.

At the Shoreditch Tribunal, Messrs. E. & C. Whitney, of City Road, E., electrical engineers, appealed for James Green, aged 39, classed B 3, an electrical fitter, for the third time. Captain Fisher said this was an electrical toy shop, but Mr. Whitney said this man had nothing to do with that; he was doing work for outside customers, wiring, and so on. They could only do work of national importance, as they could not get the materials themselves for private work, and could, therefore, only do the work for firms who got A certificates. Captain Fisher said these men were very badly wanted in the Army, and they were being called up. Mr. Harwood asked why it was that he had not got a M.A.R.O. (Munition Area Recruiting Officer) certificate if he was doing national electrical work, and Mr. Whitney said he did not think there would be the slightest difficulty, as the other men had got it. The hearing was then adjourned for him to get one, and the Chairman said that if he could not do so he might have to go into the Army.

At Accrington Tribunal, the Military Representative appealed for the cancelling of the exemption given to a man of 38, married, engaged on electrical work connected with the making of shells and fuses. Asked as to his exact occupation, the man replied that he was an electroplater. The Town Clerk: You are put down in the papers as an electric "motor." The certificate was cancelled, temporary exemption being given to January 31st.

At Torquay, an appeal was made by J. W. Lane (27, B 2), electrical fitter, and he was given until March 1st.

At Lonsdale Appeal Tribunal, the case of an electrical engineer (26) was considered. He was in business with his brother at the outbreak of war, but joined up and served six months, being discharged as medically unfit on the eve of going to France in 1915. His brother went to munitions on his return, and another brother had been on munitions at Sheffield. After being called up for medical examination he passed B 3. They had 470 customers, whose electrical instal-

lations or motors required supervision. Colonel Robinson said that such men were needed in the Army. The Tribunal ordered him to join up again on December 31st.

Before the Northants Appeal Court, the Peterborough Electric Traction Co. appealed for J. G. Manning (29, Class A), electrician. The company's representative said that they were given to understand by the Ministry of Munitions that no more men would be taken from the trams, but they had since withdrawn this, and left all appeals to the Tribunal, who would know the local conditions. Manning was the only man left to do repairs, and they had failed to obtain a substitute. Complaints had been made from various munition works that there were not sufficient cars run, and that was because they could not keep up with the repairs. Three months were conceded.

At Gloucester, the County Appeal Court heard a Military appeal against the decision of the Tribunal at Stow respecting an appeal for an electrician (25, B 1), engaged with the Electric Light Co. It was stated that the man was engaged after rejection, and was since classified B 1. The Court considered the man to be indispensable, and, giving exemption until March 31st, requested the employers to do their best in the meantime to replace him.

Lancashire Appeal Court has gone into appeals for 22 employés of the St. Helens & District Tramways Co. Eleven drivers and three inspectors are not to be called up until substitutes are found; another inspector was refused exemption, and temporary exemption until February 8th was allowed to a winder, an armature mechanic, a joiner and S.D., a controller attendant, a handy man, and a fitter's labourer.

At Oxford, Messrs. Wyatt & Son appealed for E. Green (36, C 1), electrician. He is passed for trade only, and Captain Sheild said that if taken for the Army he would be put to his trade. Two months' temporary exemption was allowed.

Essex Appeal Court has granted exemption until January 1st to R. Jefford (18), electrical engineer, of Leyton.

On the recommendation of the Advisory Committee, the Rochdale Tribunal has given exemption until March 31st to H. Smethurst (36, Class A), overhead wireman, appealed for by the Corporation tramway department.

At Northamptonshire Appeal Tribunal, on Monday, Mr. J. Cameron, the manager of the Northampton Corporation tramways, resisted the Military appeal for the open exemption to January 1st, 1918, of G. T. Webb (38, married, B 1), a traffic inspector. Mr. Cameron said Webb had been in the employ of the Corporation since 1904, and the duties of an inspector were much more onerous than they used to be. During the past two and a half years there had been 200 changes in the staff, including the introduction of 120 women conductors, and in view of these wholesale alterations it was absolutely essential that competent inspectors should be in charge. Sir Charles Knightley remarked that some of the cars did not carry anything like their full complement of passengers. Mr. Cameron replied that in the first six months of the present financial year the passengers totalled five and a half millions. The Chairman said there was no reason why tramway traffic should not be reduced, as other traffic had been cut down by the shortage of petrol. The Tribunal would allow the Military appeal to the extent of attaching finality to the certificate.

At the Hull Tribunal, a C 2 man, 33, said that he was an electrician by trade, but owing to an injury to his arm he had acted as a laundry vanman. Recently he had returned to his trade. The Military Representative said that electricians were wanted in the Army, and such men had to be sent to undergo the trade test. The application was refused.

BUSINESS NOTES.

Imports Prohibited.—A Royal Proclamation, dated November 16th, prohibits the importation, except under special licence, of the following :—

Brass rod and brass wire.
Electric meters.
Electrical motors over ⅛ H.P.
Electric hand lamps and torches.
Magnetos.
Measuring tapes and rules of all descriptions, including verniers.
Micrometers.

An Electrical Works Institute.—We have received a copy of the E.C.C. Works Institute membership card for 1917-18. The Institute is, of course, connected with the Bushbury Wolverhampton Works of the Electric Construction Co., Ltd., being provided for the recreation of the employés. Provision is made for tennis, bowls, billiards, pool, snooker pool, a lending library, physical culture, dancing class, and a holiday savings bank. The rules are delightfully brief, and cannot be described as irksome, for they read thus :—"None, except those which ordinarily govern decent conduct and good sportsmanship." Mr. W. M. Furniss, the manager, is president, and three of the directors (Messrs. P. E. Beachcroft, chairman ; James Gray, managing director ; and David Willock) appear as vice-presidents.

Book Notices.—*Lloyd's Diagram of Calculations.* By H. G. Lloyd. London : E. & F. N. Spon, Ltd. Price 2s. 6d. net (2s. 8d. post free).—This is an ingenious diagram, with which multiplication, division, proportion, involution and evolution, &c., can be performed ; it is printed on a card measuring 8½ × 13 in., and consists of logarithmic co-ordinates, together with a system of diagonal lines. Scales are printed on the four margins, and by following the lines to their intersections in accordance with the instructions, which are printed on the card, the operations above mentioned can be quickly carried out to a fair degree of accuracy. The divisions of the scale can be read to the third significant figure, giving a possible attainable accuracy of about one part in 1,000, which is maintained over the whole area of the diagram owing to the logarithmic subdivision ; we have made various trials of simple operations, the greatest error made being 1 in 1,000. Inspection of the fine lines is somewhat trying to the eyes, and the diagram is, of course, not comparable in convenience with a slide rule ; it is, however, easy to use, and certainly is very clever and interesting.

"The Work and Training of the Royal Flying Corps." London : Illustrated London News and Sketch, Ltd. Price 2s. 6d. net.—This work, which was published on Monday last, has been issued on behalf of the Royal Flying Corps, and consists almost wholly of views of the Corps at work, printed in photogravure ; the subjects dealt with cover all branches of the Corps's activities, and are exceedingly interesting in themselves, while the reproduction reaches the highest grade of excellence. There is a short introduction by Lord Hugh Cecil, the rest of the issue being pictorial. While it contains little of purely electrical interest, except some views of the training school for wireless telegraphy, the illustrations are of fascinating interest to all admirers of the work of this wonderful organisation, and the volume is well worth the price. A companion volume dealing with the sister service—the Royal Naval Air Service—is in preparation.

"Industrial Engineering, Present Position and Post-War Outlook." By F. W. Lanchester. Presidential address delivered before the Junior Institution of Engineers. London : Constable & Co. Price 1s. net.

"Training and Work of the Chemical Engineer." Reprinted from the *Transactions* of the Faraday Society. Vol. XIII. September, 1917. Price 3s. 6d.

"Science Abstracts, A and B." Vol. XX. Part 10. No. 238, October 31st, 1917. London : E. & F. N. Spon, Ltd. Price 1s. 6d. each.

Standardisation of Petrol Gauze.—At the instance of the Air Board, the Royal Aircraft Factory experts have made experiments, which have resulted in a standardised gauze being agreed upon. This will greatly facilitate manufacture, and will enable the material to be produced in Great Britain in adequate quantities to meet the demands from aircraft factories. The gauze will be known as "Air Board Standard Petrol Gauze," and all orders and inquiries should be sent to the Air Board Office, S. (H.A.) 5, Room 609, Strand, W.C. 2.

British Magnetos for British Users.—As a result of co-operation on the part of the members of the British Ignition Apparatus Association, purchasers of magnetos made by them will enjoy the many advantages which arise from standardisation in production. The complete magnetos are interchangeable, not only with one another, but with the best-known pre-war types, for every one of which there are now one or more British magnetos of similar purpose and capacity. Further, many of the essential parts are standardised and interchangeable. Screws, for instance, will be used of standard dimensions, and the different sizes of brushes are being standardised and reduced in number to one-tenth. Other parts are being dealt with in a similar way. This means, first, that spare parts will be much cheaper ; secondly, that they will be easily and quickly procurable, because agents and garage proprietors will be able to supply from stock. The advantages thus secured are increased by the fact that certain firms are concentrating on particular types in order to secure for the public the benefits which arise in efficiency and economy from quantity production.

The following list of British standard types of magnetos for the motor trade shows the corresponding pre-war types—where such exist—and the number of British firms now making them :—

British standard type.	Size and purpose.	Pre-war type.	Now being made by—
M.1	1-cyl. light weight motor cycle	Z.A.1	4 British firms
M.2	2-cyl. opposed motor cycle	Z.A.2	3 British firms
M.V.	2-cyl. V. light weight motor cycle	Z.A.V.	1 British firm
K.1	1-cyl. standard 3½/4½-H.P. motor cycle.	Z.E.1	4 British firms
K.V.	2-cyl. V. 6/8-H.P. motor cycle	Z.E.V.	2 British firms
K.2	2-cyl. (opposed) 6/8-H.P. motor cycle.	Z.E 2	2 British firms
G.4	4-cyl. for light cars	Z.F.4	4 British firms
E.4	4-cyl. for large cars and lorries	Z.U.4 / R.4	5 British firms
E.6	6-cyl. for cars and lorries	Z.R.6	4 British firms

All of these types are being supplied in large quantities to the British and Allied Governments.

In addition, there are full ranges of standardised British magnetos for aero, stationary, and marine engines, for agricultural work, and for all kinds of gas engines.

Spain.—The Sociedad Lamparas Rex has been formed at Barcelona, with a capital of 50,000 pesetas, for the manufacture of electric glow lamps.

Italy.—With its seat at Genoa, a joint-stock company has been established under the style of the Fabrica Nazionale Lampade Elettriche ad Incandescenza, having for its object the manufacture and sale of electric glow lamps and kindred accessories. The capital of the company is 60,000 lire.

Trade with Italy.—The British Chamber of Commerce for Italy (Inc.), Genoa, in its latest list of openings for British articles in Italian markets, mentions the following :—

No. 1,436.—Travelling representative would take up agencies for Italy and Colonies for beltings, lubricants, engineering articles in general, small machinery, machine tools, ironmongery, steel, household articles, &c. A.G.V.

No. 1,439.—Engineering office at Genoa would import for own account or on commission :—Machinery for steel works and rolling mills, machine tools for large engineering and shipbuilding works. G.F.S.A.

British Industries Fair.—As certain Trade Associations connected with trades eligible to participate in the British Industries Fair, 1918, have until recently been unable to hold meetings to discuss concerted participation, and in order to suit the convenience of a section of the Trade Press, the Board of Trade have decided to extend the final date for the receipt of applications for space until November 30th. The difficulties of organisation due to the war make it of the highest importance, however, that all applications should be sent into the Director, British Industries Fair, 10, Basinghall Street, London, E.C. 2, at the earliest possible moment. The applications for space so far received from manufacturers point to the coming Fair being greatly increased both in size and importance.

Catalogues and Lists.—The Parsons Motor Co., Ltd., Town Quay Works, Southampton.—Seventy-two-page catalogue giving full information respecting their marine and stationary oil engines. Stationary petrol-electric sets, from 7 h.p. to 90 h.p., are detailed with price, code-word and shipping particulars. This side of the firm's business has been largely developed during the last few years.

Messrs. Vickers, Ltd., 57, Victoria Street, Westminster, London, S.W. 1.—A series of excellently produced foreign publications. The first gives a description, also a full specification, in English, of Vickers rotary converters. The second describes the same plant in French. The third (of 30 pages) gives the same information in Russian. The fourth (24 pages) covers the ground in Spanish. Three separate publications of four pages each deal briefly in English, French and Russian, and with illustrations charmingly executed in colour, with the firm's electric crane equipments (motors, controllers, resistances, brake magnets and switchboards). These publications are prepared in such a creditable style as to make a substantial impression upon the recipient, a merit which, for foreign trade, can hardly fail to bring its reward. For all of them a thick art paper is used, and half-tone illustrations and diagrams are effectively printed.

France.—Under the style of "Automatisme et Appareillage," has been formed at Paris, a company for the development of the business of electric switches and the taking up of all patents, licences, and industrial processes relating to automatic apparatus. The capital of the company is 150,000 fr.

Dissolutions and Liquidations.—Mica Manufacturing Co., Volta Works, Cazenove Road, Stoke Newington.—R. G. Whiffen has retired from the partnership, which has been dissolved. Messrs. P. Freeman, T. J. Sack and G. H. Hadder will attend to debts, &c.

Korting Bros., Ltd.—A meeting is called for December 21st, at 53, Victoria Street, S.W., to hear an account of the winding up from the liquidator, Mr. A. G. Parker.

Trade Announcements.—We are informed that the Board of Trade have now given formal sanction to a new company, with works in London and Liverpool, and known as the British Barimar-Thermit Welding Co., Ltd., to take up and exploit the Thermit welding process, which, prior to the war, was exclusively in German hands. Thermit is especially applicable for tramway welding and for the repair of heavy castings and machine parts, and it is the intention of Mr. C. W. Brett, the managing director and general manager of Barimar, Ltd., scientific welding engineers (who is largely responsible for the formation and management of the new company), to train disabled British soldiers and sailors to carry on the work. The registered offices of the new company are at 10, Poland Street, London, W. 1.

With reference to the above, we are also asked to point out that the above company must not be confused with Thermit, Ltd., 675, Commercial Road, London, E. 14, who are the owners of the Alumino-Thermit Process Patents, and in no way connected with the new company above referred to, who merely hold a licence to work certain of the patents belonging to Thermit, Ltd. Messrs. Thermit, Ltd., were originally established in 1904, and about 18 months ago the whole of the shares were sold to the Birmingham Metal and Munitions Co., Ltd., Birmingham. Thermit, Ltd., continue their manufacture of various Thermit compounds, and are at present especially engaged upon the manufacture of certain metals and alloys in connection with munitions of war.

The Caxton House offices of the Imperial United Lamp Co., Ltd., having been commandeered by the Government, their new address is Thanet House, 231-2, Strand, London, W.C. 2. Telephone number: Central 3016-7-8. Telegraphic address: "Unilamcom, Estrand, London."

LIGHTING AND POWER NOTES.

Acton.—The Finance Committee is protesting against the continuance of increased charges in the area by the Metropolitan Electric Supply Co. The latter considers that no reduction can be made under present conditions, and states that the total profit earned by the Acton undertaking from 1911 to 1915, inclusive, was barely sufficient to meet depreciation. It was decided to acquaint the company with the Council's views, before taking other steps to have the increased charges modified.

Ashton-under-Lyne.—Price Increase.—The Electricity Committee proposes to increase the charges for electricity after the next quarter, owing to the increased cost of coal, wages, &c. The extent of the increase has not yet been fixed.

Australia.—Murrumburrah (N.S.W.) Council has decided to install an electric lighting plant, and is obtaining plans and estimates of a suitable scheme.

Barnes.—The Electricity Committee, in recommending the laying of a new cable to a local works, suggests that the firm pay £2,000 as part cost of the installation and pay the Council's current rate for power supply in the district, the firm to take a minimum supply of 500,000 units per annum for five years, and, instead of paying down the £2,000, to give security for payment and pay in addition to the charges mentioned above a charge of 1·1d. per unit, until the sum of £2,000, together with interest thereon, is paid.

The Electricity Committee recommends the following revised electricity charges :—Lighting, 4½d. per unit ; heating and power, 1½d. per unit ; that arc lighting charges be abolished, and that the alternative rateable value tariff be 1½d. and 1d. instead of 1d. and ½d.

The increased coal prices under the recent award represent an additional cost of £2,000 a year.

The electrical engineer reports that the maximum load to be handled this winter is expected to be not less than 1,300 kw., and as the total capacity of the plant installed is 1,750 kw., the margin of safety has long been passed. The Committee has decided to consider a special report as to the provision of additional plant for immediate use.

Belturbet (Co. Cavan).—Street Lighting.—The public electric lighting contract has been taken up by Mr. J. Stewart, at £70 for the season.

Brimington.—The P.C. has under consideration a co-operative scheme for electric lighting in this village.

Bradford.—Wages.—The Corporation War Wages Committee, in response to an application on behalf of over 3,000 workers in various departments, including the electricity department, has decided to increase the men's war bonus from 12s to 15s. per week, and that of the women from 6s. to 8s.

Deal.—The Board of Trade has extended for a year the powers relating to certain distributing mainlaying under the Deal and Walmer Gas and Electricity Act, 1914.

Derby.—The Electricity Committee has appealed to consumers to economise in the use of electricity during heavy load periods.

Dundee.—A suggestion was made at a meeting of the Corporation Committee that Mr. Richardson, the burgh electrical engineer, who is at present on Active Service, should be demobilised. It is explained that the department cannot take on any new consumers just now, and that it will require another great extension of the works. It was pointed out that the makers of generating machinery were getting full up with orders for after the war, and Dundee might have to wait for two or three years. A Sub-Committee is considering the matter.

Halifax.—Wages.—The award of the Committee on Production, after arbitration on the demand of workmen in certain departments—including the electricity department—is for a further advance of 3s. per week to adults, making a total of 12s. above pre-war rates. Youths under 18 years of age are awarded 1s. 6d. a week advance.

Hove.—Owing to inability to obtain apparatus, material, and labour, the T.C. has decided, until further notice, to take no orders for the supply of electricity for radiators, heaters and cookers. Only a limited number of orders for new supplies for lighting will be accepted, and then only where the length of new mains required is very short, and this not to include a road crossing.

Hucknall.—Electricity Scheme.—The Sherwood Co. has informed the Council of its willingness to supply the town with electricity, but in view of the fact that the Nottingham Corporation has decided not to proceed with its prov. order this session, it was decided that the Council's scheme should not be proceeded with until after the war. A Sub-Committee was appointed to take the necessary steps.

Kingston-on-Thames.—Year's Working.—At the last meeting of the Council, the Lighting Committee reported that it had considered an offer from Edmundson's Electricity Corporation, Ltd., to take over the Corporation electricity works, and recommended that it be not entertained, but that if the company makes

a more satisfactory offer, the Corporation will give it careful consideration.

The twenty-third annual report of the borough electrical engineer, Mr. J. E. Edgcombe, for the year ending March 31st last shows a deficit on the year's working of £6,790, as compared with a deficit for the previous year of £629. The principal reason for this deficit is the greatly increased cost of fuel owing to the larger proportion of coal which has been consumed compared to fuel oil, as on account of the fracture of the crankshaft of the two-cycle Diesel engine that plant was out of commission during the whole of the year and the larger portion of the units supplied were generated by steam plant. The comparison of the quantities generated is set out herewith :—

	1915-16.	1916-17.
Units generated by coal ...	181,987	757,980
Units generated by fuel oil ...	974,220	492,605
Total	1,156,207	1,250,585

The 757,980 units generated by steam cost in fuel £8,265, equal to 2·617d. per unit, while the 492,605 units generated by the four-cycle horizontal Diesel plant cost in fuel £865, equal to 0·421d. (or less than ½d.) per unit. The cost per unit generated increased from 3·622d. in 1915-16 to 4·618d. in 1916-17, while the receipts per unit sold declined from 3·491d. in the previous year to 3·314d. in 1916-17. The number of consumers totals 1,953, an increase of 78; the total of lamps, motors, heating, cooking, and other apparatus in terms of 32-watt lamps connected to the mains has increased to 90,342. The amount of capital expenditure outstanding at March 31st last was £66,132; the total capital expenditure on the undertaking has been £130,700. On three occasions only has there been any credit balance (amounting in the aggregate to £1,682), whilst in the other 20 years the deficits have totalled £27,217, showing a net demand on the ratepayers of £25,536. The Council decided that, having regard to the adverse balance appearing in the report and balance-sheet, 1½d. per unit be added to the existing scale for power in lieu of the increase of 20 per cent. on the scale, as from December 1st.—*Surrey Comet.*

Leeds.—Price Increase.—The Electricity Committee has decided to recommend an increase in the charges for electricity by 10 per cent., to date from April 1st next.

Lincoln.—Price Increase.—The T.C. has increased the price of current to consumers, other than those for power under agreement, by 10 per cent., as from the reading of the meters for the September quarter accounts; and has asked consumers under agreement to pay 5 per cent. increase.

London.—Poplar.—The Finance Committee reports the sanction of the L.C.C. to the borrowing of £27,825 for a new turbo-alternator and accessories, and that the County Council is prepared to advance the amount at 5½ per cent interest.

The Electricity Committee reports a deficiency on the working of the electricity undertaking for the June quarter of £1,106, as against a surplus of £1,715 in the corresponding period of last year.

Owing to the advance in the price of coal, the Committee recommends a further advance of 15 per cent. on pre-war charges for power and public lighting from November 30th next, and 10 per cent. advance on private and domestic supplies from January 1st next. The electrical engineer recommends the provision of two additional 1,000-kw. converters for sub-stations.

The Committee has considered the resolution of the Wages Conference of local authorities owning electricity undertakings in Greater London, and recommends the adoption of the award of 15s. increase upon the pre-war wage to all employés affected by the awards of the Committee on Production, and to the technical staff, to date from September 1st, such 15s. to be inclusive of any increase granted since August, 1914, as war bonus or war wages.

The Hammersmith and Battersea B.C.s have also adopted the above award.

Hammersmith.—Owing to the demands for electricity in the northern part of the borough, and especially at the White City, negotiations have been entered into with the Kensington and Notting Hill Co. for a supply of three-phase E.H.T. current, which the company is prepared to furnish at the rate of ·9d. per unit. The total capital cost, including transformers, will be about £1,500.

The Electricity Committee recommends the appointment of an additional engineer-in-charge at the generating station, with the object of improving the supervision to be exercised over the repairing staff.

The Committee reports that the B. of T. award in the matter of the linking-up scheme between Fulham, Hammersmith, and Battersea is as follows :—

The cost already incurred by the Battersea and Fulham Councils to be borne in equal proportions by all three Councils.

The cost of the main or mains required to be laid between the generating stations of the Fulham Council and the Hammersmith Council to be borne :—

1. As to the amount that the said main or mains would have cost had the agreement which was negotiated in 1915 been completed and the said main or mains had been laid in pursuance therefrom by the Battersea Council, the Fulham Council, and the Hammersmith Council respectively in equal proportions ; and

2. As to any excess over that amount, in the following proportions—that is to say, by the Battersea Council one quarter, by the Fulham Council one quarter, and by the Hammersmith Council one half.

The award of the B. of T. settles the question of the proportions in which the cost of laying the connecting main throughout the whole length from Battersea to Hammersmith shall be borne. This point having been settled, the Committee has authorised the town clerk to communicate with the Battersea and Fulham Councils with the object of completing the negotiations.

The Finance Committee recommends that application be made to the L.C.C. for sanction to the borrowing of £3,000 for transformers, &c.

Woolwich.—The B.C. has, owing to the continued increase in the price of coal and the abnormal rise in working costs, increased the charges for energy by 1½d. per unit net for lighting other than for factory use, by ½d. per unit for power users under £200 a year, and ¼d. for power users beyond that value ; the increases are not to apply to consumers with a coal clause in their contracts.

Londonderry.—The Corporation has decided to seek Parliamentary powers for the development of the electricity undertaking.

Lynn.—Price Increase.—The Electricity Committee recommends that the charges for lighting be increased by ½d. per unit, and for power and heating by 7½ per cent.

Meltham.—Proposed Provisional Order.—The U.D.C. has received offers from the Huddersfield Corporation and the Yorkshire Electric Power Co. to supply electricity in the area of the township. The terms of the Corporation are 10 per cent. above the rates in the borough, but the company has not given any definite terms. At an interview between a deputation appointed by the U.D.C. and the Corporation, it was pointed out that though the Corporation was anxious to supply electricity, it did not agree to run electric cars even if electric power was supplied to the Meltham area. At the same time, however, if the Corporation secured the supply of electric power, this would be an inducement to consider favourably the question of running cars to Meltham at some future date. The U.D.C. has approved the report of the deputation, and decided to support the Huddersfield Corporation in taking the necessary steps to obtain a Provisional Order for carrying out the work. Since the Council meeting a communication has been received that the B. of T. cannot allow the application for the Provisional Order to proceed in the ensuing session, owing to the political situation.

New Zealand.—Waihi B.C. has decided to negotiate with the Waihi Gold Mining Co. for a supply of electricity for street lighting from the Horahora power plant.

Licences have been granted to the Hamilton and Patea B.C.'s to install electrical systems for lighting and power.

Rotherham.—Prov. Order.—The Corporation has given notice of its intention to make application to Parliament in the ensuing session for an Act, among other proposals, to confirm an agreement between the Mexborough and Swinton Tramways Co. and the Corporation for the transfer to the Corporation of the Tramway Co.'s electricity undertakings, authorised by the Rawmarsh Electric Lighting Order, 1898, the Swinton Electric Lighting Order, 1899, and the Mexborough and Swinton Tramways Acts, 1902 and 1905 ; to empower the Corporation to supply electricity to the Tramway Co. in bulk or otherwise, and to extend the area of the Corporation for the supply of electricity, so as to include (in addition to the borough and the urban districts of Rawmarsh and Swinton) the urban district of Greasborough, the rural district of Rotherham, and the parish of Ecclesfield, in the rural district of Wortley.

St. Helens.—The income of the electricity department for the past year amounted to £40,656, and the expenditure to £41,158, leaving a deficiency of £501.

Southport.—Improvements effected at the Corporation electricity works during the past three years in connection with the fuel plant, have resulted in a reduction of the amount of fuel used by 50 per cent. But for this the price of energy would have been considerably increased.

Stockbridge.—Prov. Order.—The U.D.C. proposes to apply to the B. of T. for a provisional order for electricity supply within the urban district.

Stratford-on-Avon.—The Electricity Committee has refused the request of the Electricity Co. for permission to increase the charges for energy, and the Council has confirmed this decision.

Tasmania.—The *Hobart Mercury* says that the State Government intends to create a Water Commission to control the water supplies of the island, concerning which reports are at present being obtained.

Walsall.—The local Chamber of Commerce has passed a resolution expressing concern at the 20 per cent. increase in electricity charges. A member of the Electricity Committee defended the increased charges, which were necessitated by the increased expenses of the undertaking.

W. Yorks.—Provisional Orders.—The Electrical Distribution of Yorkshire, Ltd., is proposing to apply to the B. of T. for Provisional Orders for electricity supply in Luddenden Foot and Mytholmroyd.

TRAMWAY AND RAILWAY NOTES.

Argentina.—Railway Electrification.—At the annual meeting, last week, of the Central Argentine Railway, Sir Archibald Williamson, Bart., M.P., stated that they had only about one-third of their suburban electrified undertaking equipped and working; the other two-thirds, when circumstances permitted of their being finished, would cost a small sum as compared with the first section. Although the main-line passenger traffic showed decreases, they had increases in suburban traffic wholly due to that part of the line where electric traction was in use.

Australia.—On the second reading of the Victorian Government's Melbourne and Metropolitan Tramways Authority Bill, Sir Alexander Peacock (the Premier) said that on a date to be fixed the duties of the Melbourne Tramways Board would pass to the new authority under the Bill, and not more than six months later the following would be taken over by the authority:—The Prahran and Malvern Tramways Trust, the Hawthorn Tramways Trust, the Melbourne, Brunswick, and Coburg, Fitzroy, Northcote and Preston, South Melbourne, Footscray, and Melbourne and Essendon tramway systems. Power would also be given to lease or acquire the St. Kilda-Brighton and Sandringham and Black Rock street railways. One controlling authority would mean economy, and any extensions would then be carried out in accordance with a general plan.

The tramway area would be divided into 12 districts; each would return one member to the Board, while the chairman and one other member would be nominated by the Governor in Council. The working expenses, interest, &c., would be apportioned to the car-mileages of the various systems. The members of the Board appointed by the Governor in Council would hold office for five years, the other members would be elected for three years.

The authority, with the consent of the Governor in Council, could borrow up to £750,000, exclusive of any principal sums transferred to it from the existing authorities. One of the first duties of the authority would be to prepare a general scheme for the future development of metropolitan tramways. Any new tramway services would be considered in connection with the services provided by the suburban railways. Out of the tramway revenue every year was to be paid a sum to be determined to recoup the loss caused to the railways by any tramways of the authority constructed within five years before the commencement of the Act, or constructed thereafter, and the construction of which was objected to by the Railway Commissioners.

When the Melbourne and Essendon tramway and electrical undertakings were acquired, the authority must have power to operate them. For this and other undertakings the authority would be authorised to purchase, generate, and supply electricity—and to supply it to municipalities to light any roadways along which the authority's tramways ran. Before the erection of new power houses and installation of new electric plant by the authority the approval would be necessary of the Railway Commissioners, or such body as Parliament decided would control metropolitan electric supply. The principal electric supply undertakings were controlled by the Melbourne Electric Supply Co., the City Council, and the North Melbourne Electric Tramway and Lighting Co., Ltd. The tramway authority might acquire a Council's undertaking by agreement, and a private undertaking either by agreement or compulsorily. The capital cost of the undertaking was to be the basis for municipal rating. Capital cost of the works and undertakings would be on the original construction cost, and the rateable capital cost would be the capital cost of so much of the authority's properties as were rateable to municipalities.—*Australian Mining Standard.*

Birmingham.—The number of passengers on the tramways has increased by over half a million per week as compared with this time last year. The increase last week was 859,360. Mr. Harrison Barrow, the chairman of the Corporation Tramway Committee, states that when the war is over the following schemes should engage immediate attention:—Tramway track repairs, provision of single-deck cars with trailers (the experiment has been thoroughly successful), the construction of the lines authorised in the 1914 Act, to show the advantage of the separate track, and the extension of the system for carrying heavy goods.

Blackburn.—Female Drivers.—The quarterly meeting of the Lancashire and Cheshire Tramways Managers' Association was held at Blackburn on November 16th, Mr. J. H. Cowell, manager of the Corporation tramways, presiding. During the transaction of business several topics were discussed, considerable interest being taken in the question of the suitability of female drivers; Blackburn was one of the pioneers in this matter. The delegates were given a practical demonstration of the efficiency of such drivers by Miss Nellie Sharratt, who drove the delegates over certain routes, during which a call was made at the depôt at Intak, which was thoroughly inspected.

Continental.—Italy.—The Società Anonima Idroelettrica dell'Appennino has been formed at Bologna, with an initial capital of 1,000,000 lire, and an eventual capital of 6,000,000 lire, for the utilisation of the water-power of the Apennines for the electrification of railways and tramways. An influential council of administration has been nominated.

India.—Railway Electrification.—According to the *G.I.P. Magazine*, for some time past the question of electrifying parts of the G.I.P. system has been under consideration, and although nothing definite has been decided upon, it is highly probable that on the conclusion of the war an electrification scheme will be carried out.

London.—Central London Railway.—The B. of T. has extended by one year the time under the Central London Railway Act, 1913, relating to the construction of certain railways and works.

Musselburgh.—At the local Town Council the condition of the electric tramways came in for criticism, surprise being expressed that the B. of T., to whom the Council had addressed several complaints about accidents on the tramway system, had written that "the responsibility for the proper maintenance of the tramway undertaking rested with the promoters, and that the Board did not carry out any system of periodic inspection of tramways." It was suggested that Edinburgh T.C. might be approached, to consider taking over system, but no motion was made.

Tramway Workers and Christmas Holiday.—Members of the Amalgamated Association of Tramway and Vehicle Workers are agitating for a general holiday on Christmas Day. It is stated that a request has been sent to all the tramway concerns in the country asking for this concession. Some Tramway Committees are in favour of granting the request, but a good many are against, amongst the latter being Manchester and Salford. The employés, however, are going forward with the movement.

Wharfedale.—Railless Traction.—The Otley U.D.C is in negotiation with the Councils of Guiseley and Menston with a view to sending a joint deputation to Mr. J. B. Hamilton, the Leeds tramway manager, to try to secure a better service of the railless cars in Wharfedale and the erection of shelters at the exposed country termini.

TELEGRAPH AND TELEPHONE NOTES.

Brazil.—The Government has opened a credit of 1,000,000 milreis to complete the work of establishing new radio-telegraphic stations and increasing the telegraphic lines for the Army and Navy.

Unknown persons have attempted to set fire to the radio-telegraphic station connecting Monte Babilonia with Rio de Janeiro. —*Financier.*

United States.—The War Income-Tax Bill, which took effect on November 1st, places a tax of 5 cents upon each telegraph, telephone, or wireless message or conversation which originates within the United States, and for the transmission of which a charge of 15 cents or more is imposed.—*T. and T. Age.*

CONTRACTS OPEN AND CLOSED

OPEN.

Australia.—Perth.—December 5th and 12th. Postmaster General's Department. Telegraph and telephone instruments and parts, battery material and telephone switchboards, parts, &c. See "Official Notices," November 16th.

Adelaide.—December 12th. P.M.G.'s Department. Telephone material. Schedules 478 to 482. See "Official Notices" to-day.

Carlisle.—December 4th. Electricity Department. One 1500/2000 kw. turbo-alternator and one surface condensing plant. See "Official Notices," November 16th.

Enniskillen.—December 1st. Sligo, Leitrim & Northern Counties Railway Co. Telegraph material for 12 months. Mr. J. Duff, Secretary, Enniskillen.

France.—Lyons.—Tenders are invited for the supply of two batteries of accumulators of 12 elements each (capacity 1,080 ampere-hours), and of sundry machines (motors, dynamos, switchboards, &c.), for the central telephone exchange at Lyons. Particulars from the Direction des Postes et Télégraphes du Rhône, 33, bis, Rue Vaubecour, Lyons.

Grimsby.—November 30th. Electricity Department. Twelve months' supply of coal. Deputy Electrical Engineer.

Manchester.—December 12th. Three fan draught cooling towers at the Stuart Street station, for the Electricity Committee. See "Official Notices," November 16th.

Rathmines.—November 28th. U.D.C. 500 tons of coal for the electricity works. Electricity Engineer.

CLOSED.

Bury St. Edmunds.—T.C. 100 tons of 2-in. Mapperley slack coal, for the electricity works; Carr Bros. & Co., 27s. per ton.

Government Contracts.—List of new contracts placed October, 1917 :—

WAR OFFICE.

Dynamos, switchboards, &c.—Lancashire Dynamo Co., Ltd.
Generating sets and spares.—Austin Motor Co. (1914), Ltd.; Coventry Simplex Engines, Ltd.; Electric Construction Co., Ltd.; R. A. Lister and Co., Ltd.; Phœnix Dynamo Manufacturing Co.
Insulators (field).—Bullers, Ltd.; F. W. Cotterill, Ltd.
Petrol-electric vehicles.—Stevens Petrol-Electric Vehicles, Ltd.
Motors.—E. Brook, Ltd.; Crypto Electrical Co.; Macdonald, Syer & Co., Ltd.; F. Parkinson & Co.
Works services "electrical."—Parsons Motor Co.

INDIA OFFICE STORE DEPARTMENT.

Accumulator plates.—Chloride Electrical Storage Co.
Bells.—Peel-Conner Telephone Works, Ltd.
Cells.—General Electric Co., Ltd.
Fittings for telephone parts.—Siemens Bros. & Co.
Wire.—R. Johnson & Nephew; Johnson, Mathey & Co.

H.M. OFFICE OF WORKS.

Engineering services.—Barry Dock Grain Stores electric generating plant; Crompton & Co., Ltd.
Cardiff Grain Stores electric supply.—Harland Engineering Co.
Avonmouth, Barry, Cardiff, and Newport conveyor weighing plant.—Spencer & Co.
Grain Stores generally, flexible cables.—B.I. & Helsby Cables, Ltd.
Ordnance Survey Office Overseas.—Electrical motors and starters; Crompton & Co., Ltd.
Swansea King's Dock.—Electric light and power wiring; Lund Bros. & Co.
Key switch holders.—General Electric Co., Ltd.

POST OFFICE.

Protective apparatus.—L. M. Ericsson Manufacturing Co., Ltd.
Telegraph apparatus. Automatic Telegraph Manufacturing Co., Ltd.; India-Rubber, Gutta-Percha, and Telegraph Works Co., Ltd.
Telephone apparatus.—British L. M. Ericsson Manufacturing Co., Ltd.; Peel-Conner Telephone Works, Ltd.; Western Electric Co., Ltd.
Insulator covers and bodies.—Bullers, Ltd.
Submarine cable.—Siemens Bros. & Co., Ltd.; Telegraph Construction and Maintenance Co., Ltd.
Telegraph cable.—B.I. & Helsby Cables, Ltd.; Callender's Cable and Construction Co., Ltd.; Connolly Bros., Ltd.; W. T. Glover & Co., Ltd.; Henley's Telegraph Works Co., Ltd.; Johnson & Phillips, Ltd.; Union Cable Co., Ltd.
Telephone cords.—London Electric Wire Co. & Smiths, Ltd.; Western Electric Co., Ltd.
Telephone plugs.—Automatic Telephone Manufacturing Co., Ltd.; British L. M. Ericsson Manufacturing Co., Ltd.; Western Electric Co., Ltd.
Telegraph poles.—Bullers, Ltd.
Insulator spindles.—Bayliss, Jones & Bayliss, Ltd.
Telephone terminals.—D. Gibson & Co., Ltd.
Bronze wire.—T. Bolton & Sons, Ltd.; B.I. & Helsby Cables, Ltd.; F. Smith & Co., incorporated with the London Electric Wire Co. and Smiths, Ltd.
Galvanised iron wire.—R. Johnson & Co., Ltd.; Shropshire Iron Co., Ltd.; F. Smith & Co., Wire Manufacturers, Ltd.; Whitecross Co., Ltd

Sunderland.—T.C. Tenders accepted :—

Dewhurst Engineering Co., Sheffield.—Steel tubes.
Minton & Hollins, Ltd., Stoke-on-Trent.—Tiles.
B.I. and Helsby Cables, Ltd.—E.H.T. box compound.

FORTHCOMING EVENTS.

Institution of Electrical Engineers (Student's Section).—Friday, November 23rd. At 7 p.m. At the City and Guilds (Engin.) College, Exhibition Road, Kensington, S.W. Opening meeting. Address by Sir Oliver Lodge, F.R.S., on "Astronomical Applications of the Electrical Theory of Matter."

Manchester Local Section.—Tuesday, November 27th. At the Engineers' Club. At 7 p.m. Paper on "Gas Firing Boilers," by Mr. T. M. Hunter.

Junior Institution of Engineers.—Friday, November 23rd. At 39, Victoria Street, S.W. At 8 p.m. Paper on "Housekeeping in Workshops," by Mr. D. W. Woods.

Physical Society of London.—Friday, November 23rd. At 5 p.m. At the Imperial College of Science, South Kensington, S.W. Ordinary Meeting.

Royal Society of Arts.—Wednesday, November 28th. At 4.30 p.m. At John Street, Adelphi, W.C. 2. Paper on "Aerial Transport after the War," by Mr. G. Holt Thomas.

Greenock Electrical Society.—Thursday, November 29th. At 7.45 p.m. At 24, West Stewart Street. Open night for discussion.

Institution of Municipal and County Engineers.—Friday, November 30th. At 5 p.m. At Burlington House, Piccadilly, W. Discussion on the "Supply of Power or Fuel to Vehicles on Public Highways."

Institution of Mechanical Engineers.—Friday, November 30th. At 6 p.m. At the Institution of Civil Engineers, Great George Street, S.W. The Thomas Hawksley "Lecture on Heat Engines," by Capt. H. Riall Sankey, C.B., R.E.

Salford Technical and Engineering Association.—Saturday, December 1st. Visit Manchester Corporation Hydraulic Pumping Station. At 7 p.m. At the Royal Institute. Annual Meeting.

NOTES.

The Red Book.—In consequence of the increased cost of production and other difficulties due to the war, the proprietors of this Electrical Directory do not propose to issue the usual annual edition, at least until more normal conditions obtain.

Whist Drive.—The annual whist drive and dance arranged by the employés of the Blackpool Corporation electricity and tramways department took place on November 15th, and proved very successful. Between 2,000 and 3,000 people were present.

Belfast Electrical Employes: Award.—The following award in respect of the difference between the Belfast Corporation and the Electrical Trades Union with regard to certain men formerly in the employment of the Corporation has been issued :—

The Committee on Production, to which the matter was referred, finds :—

1. That the transfer of the work of overhead tramway line maintenance from the electricity department of the Corporation was part of a *bona fide* scheme of reorganisation which the Corporation were entitled to carry out.
2. That the employment by the Corporation of skilled electricians to do the work of overhead line maintenance during the period whilst that work was in charge of the electricity department did not debar the Corporation from adopting, and that they were entitled to adopt, after the transfer to the tramways department, the practice followed by many tramway authorities in different parts of the country of employing linesmen or handy men to do the work of overhead line maintenance.
3. That the dismissal of the seven men concerned in this reference along with other men who were discharged at the same time was carried out in consequence of the improved organisation adopted, and was not carried out merely with a view to reduce the wages of the seven men concerned.
4. That the contract of service of the seven men concerned was duly terminated on August 23rd, 1917, after adequate notice, and the men were not illegally dismissed.
5. That the claim for reinstatement of the seven men concerned has not been established.
6. That in consequence of the pending dispute as to the respective rights of the Corporation and the men concerned, the men had some reasonable ground for claiming that termination of their conduct of service should be suspended until the difference were settled by arbitration, and the Committee think that on this ground the Corporation should pay, and they award that they do pay, wages at the rates in operation on August 23rd, to the seven men concerned up to the date of this award.

Legal.—BOSCH MAGNETO CO., LTD.—The Board of Trade petitioned, in the Chancery Division, on Tuesday, before Mr. Justice Younger, for the winding up of the Bosch Magneto Co., Ltd., under the Trading with the Enemy (Amendment) Act, 1916.

Mr. Austin Cartmell, who supported the petition, said this was as German a company as they well could have. At the outbreak of the war over 49,900 of the shares were held by Germans and 50 by one gentleman in London. This was essentially a German-owned company, and it was formed for the purpose of carrying on a German business. Messrs. Bosch & Klein and the English gentleman to whom he had referred were the only directors. After the outbreak of war the German directors transferred certain large powers to the English gentleman. The company had now been ordered by the Board of Trade to be wound up. The funds now in the hands of the Controller amounted to nearly £200,000. There were certain questions affecting the London Corporation which could only be dealt with in the winding up of the company.

Mr. Galbraith said the London Corporation claimed to be creditors for a very considerable amount, and they desired that the winding up should take place at an early date.

His Lordship made the order.

Foreign Trade.—OCTOBER FIGURES.—The official returns of imports and exports during last month contain the following electrical and machinery figures :—

	October, 1917.	*Inc. or dec.*	10 *months*, 1917. *Inc. or dec.*
IMPORTS.			
Electrical goods ...	111,272	− 24,294	− 214,249
Machinery	914,756	+363,117	+ 299,804
EXPORTS.			
Electrical goods ...	216,687	−148,101	− 1,003,983
Machinery	1,441,594	−379,335	+ 47,324

Parliamentary.—The following applications for Parliamentary powers appeared in the *London Gazette* for November 20th :—

Leicester Corporation.—Electric lighting prov. order covering various powers.
Crompton U.D.C.—Electric lighting prov. order, bulk supply from Oldham Corporation.
Royton U.D.C.—Electric lighting prov. order, bulk supply from Oldham Corporation.
Greasborough (near Rotherham) U.D.C.—Electric lighting prov. order, powers to take bulk supply.
Braintree.—Crittall Manufacturing Co., Ltd.—Electric supply prov. order for urban district, bulk or otherwise.

I.E.E. Discussion on the Metric System.—As the subject of the metric system was fully discussed at the Institution of Civil Engineers in the early part of the year, more especially from the standpoint of the relative merits of that system and the British, we are informed that the main object of the I.E.E. discussion, which is to take place on Thursday, December 13th, is to consider the effect on the British electrical trade of the introduction of the metric system at the present time, more especially in those markets in which the British system is at present in vogue, with a view to determining whether the compulsory introduction of metrical measures should be pressed for or resisted. It is hoped that it may be found possible to take steps after the discussion to obtain some authoritative pronouncement on the matter from the trade as a whole that will put an end to the present hesitating and unsatisfactory attitude towards the question.

The L.C.C. Education Committee has revoked its recommendation in favour of the compulsory introduction of the metric system.

Control of Tramway Labour, &c.—In connection with the B. of T. Committee on Tramway Labour and Materials, the Executive Council of the M.T. Association has nominated Messrs. A. R. Fearnley, J. B. Hamilton, and J. M. McElroy to serve on that Committee; Mr. A. L. C. Fell will represent the L.C.C. tramways, and two members will be nominated by the T. and L.R. Association to represent, principally, company undertakings, while the chairman, Mr. Jas. Devonshire, has been nominated by the Board of Trade.

Inquiry.—Makers of the "Acme" engine governor are asked for.

Institution and Lecture Notes.—Physical Society of London.—At the meeting held on October 26th a paper on "The Radius of the Electron and the Nuclear Structure of Atoms" was read by Prof. J. W. Nicholson. The electron is usually regarded as a globule of electricity with a definite radius. This conception has proved valuable, but involves difficulties in connection with the nuclear structure of complex atoms. On the view that the electron consists of a region of strain in the æther, such line constants should have some significance throughout the whole æther; which may, in fact, be in some manner cellular with these linear magnitudes involved in the specification of the cells, and therefore in any strained structure composed of them. The electron would be regarded as a state of strain which for practical purposes is concentrated at its centre, rapidly diminishing outwards according to some very convergent law involving some line constant in its specification. By way of illustration the idea is worked out mathematically on the assumption that the strain varies as $e^{-\lambda r}$, on which hypothesis λ^{-1} is the "radius." It can be shown that the Lorentz formula for mass as a function of velocity can be obtained for this type of electron. The charge on the electron is regarded as a fundamental property of the æther, and is related to Planck's constant h.

Dr. H. S. Allen said there could be little doubt of the existence of a relation referred to by Prof. Nicholson between Planck's constant h and the charge of an electron e. Taking Millikan's latest value for e ($4{\cdot}774 \times 10^{-10}$), $h = 6{\cdot}558 \times 10^{-27}$. All the principal radiation constants could be expressed in terms of e. On the lines suggested in Prof. Nicholson's paper it would seem as if most, if not all, of the important constants of nature might be referred to some fundamental property of the æther.

Sir Oliver Lodge wrote that he was much interested in Prof. Nicholson's ingenious plan for doing away with the definite boundary of an electron, and devising a mathematical scheme which should enable them to regard it as a point-centre of strain decreasing exponentially in every direction without limit, so that the linear dimension associated with it should be—like many time-constants—the distance at which the density was reduced to $1/e$th of what it was at the centre. This plan, if it could be developed properly, seemed to get over many of the difficulties about the coherence of parts of a charge, and about the extraordinary properties of a nucleus, which though, from some points of view, an extremely small and highly-charged unit, yet necessarily had a complexity which enabled it to be disintegrated and fired off in fragments. Prof. Nicholson's suggestions seemed to him helpful and valuable.

Association of Mining Electrical Engineers.—On October 13th, the president of the West of Scotland Branch, Mr. H. A. M'Guffie, delivered his address, and on November 10th the works of the North British Welding Co. at Finnieston were visited, a demonstration of electric welding being given. The other arrangements for the session are as follows:—

December 15th.—Visit to the works of Mavor & Coulson. Social evening.
January 12th, 1918.—"Cable Complaints," by J. H. C. Brooking.
February 16th.—"Steam Turbines as Applied to Colliery Work," by P. J. Pliven.
March 9th.—"Conservation of Exhaust Steam and its Utilisation," by J. Watson.
April 6th.—Inspection of mechanical and electrical models at the Art Galleries, Kelvingrove.
May 6th.—"Organisation of Electrical Repairs," by J. M'Cann.

Members of the North of England Branch, on November 3rd, visited Washington Colliery, County Durham, and inspected the electrical equipment at the "F" and Glebe Pits. There is an extensive electrical installation at these pits, which was commenced in 1907 by the fixing of a Sirocco fan. Current from the County of Durham Electrical Power Distribution Co. is received at the pit yard at 6,000 volts, and reduced to 600 volts by two 500-K.V.A. transformers. The fan above mentioned is belt-driven by a motor of 150 H.P., and, running at 164 R.P.M., supplies 120,000 cb. ft. of air at 2½ in. W.G. This displaced a 36-ft. Guibal fan, steam driven, and the successful result of the conversion led to the elimination of a good deal of steam plant at the "F" Pit. Underground at the "F" Pit there are four main and tail haulage sets converted from steam drive; the change-over from steam to electricity caused so little trouble that not one ton less coal was drawn during the whole operation. Other plant is:—Air compressor, 900 cb. ft. capacity, motor 150 H.P.; air compressor, 300 cb. ft., 60 H.P.; main and tail haulage set, 25 H.P.; endless rope set, 27 H.P.; endless rope set, 10 H.P.; "creeper," 5 H.P.; pump, 110 H.P. At the Glebe Pit there is on the surface an air compressor of 2,000 cb. ft. capacity, driven by a 350-H.P. motor. Underground there are two main and tail haulage sets, driven respectively by 75 and 80-H.P. motors, an air compressor, and a three-throw pump, 110 H.P.

Institution of Mechanical Engineers.—At the meeting, last Friday, Mr. A. W. Purchas read a paper on "Air-lift Pumping," in the course of which he endeavoured to supply a satisfactory theory of the working of this type of pump, to show how the efficiency could be improved, and to point out the data that should be recorded in testing such pumps in order to provide the information necessary to the correct interpretation of the results.

The paper included details of the equipment and methods employed in making a number of tests, and laid stress on the liability to serious errors incurred if the volume of air was calculated from piston displacement—errors of 10 to 60 per cent. The greatest loss, he said, was in the air-compressor; the next greatest was the loss of head at entry to the eduction pipe. A pump efficiency of 70 per cent. should be attainable on all lifts up to 300 ft.

Institution of Electrical Engineers.—The opening meeting of the Manchester Local Section was held on the 13th inst., when the chairman (Mr. C. J. Beaver) delivered his inaugural address. He dealt with the effects of the war on the world's industry in general, and on industrial progress in this country in particular, and, after reviewing the trend of opinion amongst various classes, he detailed a series of reforms which appeared to be necessary, and indicated the important part that should be played by the Institution in connection with their realisation.

On November 14th, Mr. S. T. Allen, chairman of the Birmingham Local Section, delivered his inaugural address, dealing mainly with the future course of the manufacturing industry in this country and the part that might be played by the Institution in connection therewith. In particular, he referred to the remarkable developments in electrometallurgy and in the use of the electric furnace which had taken place in the Midlands, and emphasised the necessity for a cheap supply of electrical energy to enable the new industries to compete with foreign countries after the war. The waste at present incurred through the transport of fuel and the removal of incombustible materials, and other sources of loss, were mentioned, and the chairman concluded by pointing out the necessity of utilising the inventive capacity of everyone interested in the electrical industry.

Royal Institution of Great Britain.—Prof. J. A. Fleming, D.Sc., F.R.S., will deliver a Christmas course of six illustrated lectures (adapted to a juvenile auditory) on "Our Useful Servants: Magnetism and Electricity":—

Thursday, December 27th, at 3 o'clock.—"Magnets and the Magnetic Compass."
Saturday, December 29th.—"Electricity and Electric Currents."
Tuesday, January 1st, 1918.—"The Electric Current as a Heater and Chemist."
Thursday, January 3rd.—"Electricity as an Illuminator and Doctor."
Saturday, January 5th.—"Electric Dynamos, Motors, Transformers, and Railways.
Tuesday, January 8th.—"Telegraphs and Telephones."

Royal Society of Arts.—Delivering the opening address on Wednesday, Mr. A. A. Campbell Swinton (Chairman of the Council) dealt with "Science and its Functions." He pointed out the danger that the working out of industrial processes and inventions, involving the risk of vast sums of money, might be checked through the fashion of regarding the making of large profits as a crime. He also urged the necessity of having science as a compulsory part of the curriculum of training for the Civil Service, so as to get the Departments filled by men who realised how science lay at the root of all material progress.—*Morning Post.*

Liverpool Engineering Society.—The opening meeting of the session was held on November 7th, when Mr. H. Dickinson delivered his presidential address. On Wednesday last, Mr. J. B. C. Kershaw read a paper on "The Conservation of Our Fuel Reserves by the Use of Low-Grade Fuels for Power Generation." On December 5th Mr. E. Jones will read one on "High Efficiency Air Pumps for High Vacua."

Birmingham Electric Club.—Mr. Howard Foulds, secretary of the City Electric Supply Department, read a paper, on Saturday last, before the Birmingham Electric Club, on the subject of "Publicity." Notwithstanding the pressure of Government work, he insisted that it was necessary to be prepared for the time when conditions became normal. Then a publicity campaign might be undertaken individually or collectively. Sound publicity could be obtained by careful and wise expenditure in the ordinary course of business. Persistency was one of the fundamentals of success.

Chadwick Public Lectures (Leicester).—On November 17th the first of a series of three Chadwick Lectures on "Electricity and National Welfare" was given at the Museum, Leicester, by Prof. H. T. Davidge, of the Ordnance College, Woolwich. The lecture dealt with "Electricity and the Improvement of Town Atmospheres." Mr. Davidge stated that the special aim of the lectures was to urge the pressing necessity for applying the latest developments of electrical science as an aid to:—

(*a*) Making the best of our homes.
(*b*) Making the best use of our soil.
(*c*) Making the best of our bodies.

Recognising that a large part of mankind tends to congregate into towns, the drawbacks of town atmosphere were pointed out, and the use of electricity was described, when used as a palliative, in removing smoke and fumes after formation. The wider problem of smoke and fume prevention was then discussed, and after sketching the delights of a district completely supplied electrically with heat, light and power, the lecturer showed that the need was urgent for a system of power stations on a large scale, using very efficient, and, therefore, large generators, the cheapest fuel, the highest possible load factor, high voltage to obtain efficient distribution, and interlinking between the stations to economise in spare machinery. Broad-minded and highly instructed legislation was indicated as a necessity.

The second lecture of this series, on "Electricity and Increased Food Production," will be given to-morrow at 7.30 p.m.

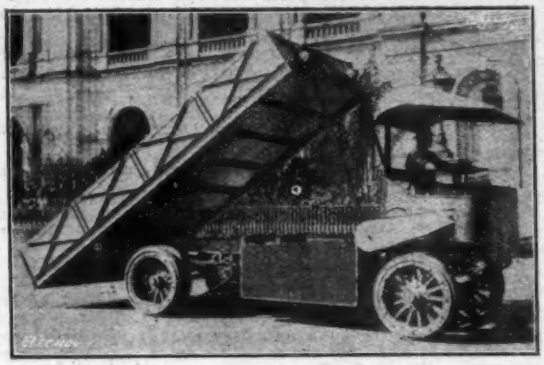
Australian Copper.—Reuter's Melbourne correspondent says that the Australian Copper Producers' Association has been formed entirely to control the shipping and selling of copper on a co-operative basis. Before the war copper was sold almost entirely through the German metal ring.

National Reconstruction.—The Education Committee of the British Science Guild, on the 5th inst., passed a resolution to the effect that national reconstruction, in order to be efficient, urgently demanded as a primary condition that the Education Bill introduced on August 10th should be proceeded with in the House without delay, and should be passed into law during the present session. The Executive Committee of the Guild, last week, approved the resolution, copies of which were sent to the Prime Minister and to Mr. Fisher.

Electric Vehicle Notes.—The Detroit Taxicab and Transfer Co. (U.S.A.), which operate nearly a hundred electric taxis, has decided to obtain women to operate them between the hours of 7 a.m. and 6 p.m.; over 500 women have applied for positions. Chicago and St. Louis also have growing fleets of electric taxicabs.

The Wellington (New Zealand) Harbour Board has carried out a series of tests with a 4,000-lb. battery truck of the warehouse type. This is equipped with Edison batteries capable of running the truck for a full working day, and is the first "electric" of this type seen in New Zealand.—*Board of Trade Journal.*

The City Electric Light Co., Ltd., Brisbane, Australia, has put into service a 5-ton electric self-tipping lorry for the purpose of carting coal from the Roma Street Railway coal shutes to the

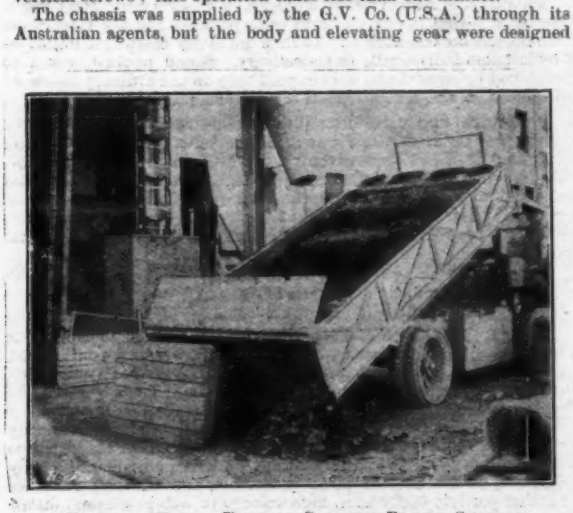


Electric Coal Truck at Brisbane, Australia.

power station in William Street, a distance of, approximately, 1¼ miles. The following particulars were supplied by Mr. John D. Just, the manager of the company:—

The lorry, which weighs approximately 10 tons when loaded, is operated from a 44-cell Chloride ironclad Exide battery, and has a range, when loaded, of 45 miles on one charge, with a speed of 7 miles per hour. The body of the lorry can be elevated to an angle of 45°, and is, therefore, self-emptying, whilst it is filled by gravity at the coal shutes. The elevating of the lorry body is done by a 3-H.P. electric motor driving through gearing two vertical screws; this operation takes less than one minute.

The chassis was supplied by the G.V. Co. (U.S.A.) through its Australian agents, but the body and elevating gear were designed



Electric Truck Tipping Coal at Power Station.

and built in Brisbane. The lorry and its driver are now handling 50 tons of coal daily, and have replaced eight tip drays; the average consumption of electricity by this lorry, taken over one month, was 2·43 units per route-mile. The electrically-operated lorry has a great future before it, and the large capacity motor lorry can more than hold its own against the antiquated horse drays.

In this connection, it is interesting to notice that, in his recent annual report Mr. A. C. Cramb, the Croydon borough electrical engineer, mentions that a 4-ton electric lorry has been in commission from the beginning of the year, and during the first six months hauled 3,110 tons of coal at a cost for wages and electricity of £107, or taking a vehicle life of eight years, and setting aside £78 for depreciation and £46 for repair fund, a total cost of £231, which shows a saving of £46 on contract haulage for the six months. The battery is guaranteed for eight years, and although £46 has been credited to repairs, the actual cost has been nominal. During the last three months a bonus system was in use, and 2,215 tons were carted, a 42·5 per cent. weekly increase. The cost was £132 against £203 by horse haulage, showing a saving at the rate of £250 per annum.

Volunteer Notes.—County of London Volunteer Engineers (Field Companies).—Headquarters, Balderton Street, Oxford Street, W., 1.

Orders for the week, by Lieut.-Colonel C.B. Clay, V.D., commanding:—
Officer for the Week.—Lieut. W. J. A. Watkins.
Next for Duty.—Second Lieut. H. G. Golding.
Drills.—Week ending Saturday, December 1st, 1917:—
Monday.—No. 3 Company, Left Half. Recruits, signalling, 6.30.
Tuesday.—Physical drill and bayonet exercise, 7.30.
Wednesday.—No. 1 Company, 6.30.
Thursday.—No. 2 Company, 6; signalling, ambulance, 6.30.
Friday.—No. 3 Company, Right Half. Recruits, 6.30.
Saturday.—Commandant's Parade, 2.45, at Headquarters. Uniform. For route march and drill. Compulsory for A, B, and C men, unless special leave is obtained.
Musketry.—Belvedere Road, Tuesday, Wednesday, and Thursday, 5.30 to 7.
Note.—The Medical Officer will attend for examination of recruits, &c., on Thursday, at 6.
Unless otherwise indicated, all drills will take place at Headquarters.

(By order) Macleod Yearsley, *Capt. and Adjutant.*

Electrical Ship Propulsion.—The new U.S. battleship *New Mexico*, now being built at the New York Navy Yard, the first warship in the world to be electrically driven, is approaching completion. An official statement was prepared not long ago in Washington, which gave some of the advantages of the electric drive on the larger ships, and was published in the *Electrical World*; this was the statement:—

"Electrical propulsion virtually gives duplicate means of propulsion. With two turbines and two motors, one or either of them could break down and still leave a means of propulsion; this is, of course, true in the case of direct-connected machinery, but in the case of the electric drive, if it is a turbine that is broken down, the propulsion would still be twin-screw. The two turbines would be so designed that either would be capable of giving about 17 or 18 knots, and the normal method of running would be with one turbine and two motors. This makes it possible to overhaul the other turbine, whether it is at sea or not. The turbines are always operated under fairly good load conditions, and, hence, always give good economy. Since only one turbine is used at the lower speeds, the load on it will always be twice as much as for direct-connected machinery. The turbines are always operated under fairly good speed conditions, and this ensures good economy of the turbines. This is due to the fact that the speed reduction ratio is variable. This is accomplished by winding the stators of the motors for two different numbers of poles, either of which can be put into operation by simply throwing a switch. For example, if the generator has two poles, and the motors are arranged to have either 30 poles or 50 poles, the reduction in the first case would be 15 to 1, and in the second case 25 to 1. This combination of good load conditions and high speed is really the vital point, so far as economy at cruising speeds on a battleship is concerned; and it is an advantage that any other form of propulsion will find it difficult to overcome. The governor absolutely eliminates all racing in a seaway, with the attendant strains on shafting and danger of throwing propeller blades. Speed can be maintained with much greater accuracy than with any other form of propulsion. This is of little importance to a merchantman; but it is not necessary to emphasise the importance of this in a battleship to anyone who has been in the Fleet. The space taken up is less than required for other forms of propulsion. The arrangement of the machinery is much more flexible than any other form of propulsion, as the position of turbines and motors is not fixed. The readiness with which repairs can be effected is an argument. Owing to the small size of the turbines, the upkeep will be very materially reduced. The rapidity of operation is much greater than with other forms of propulsion."

Electric propulsion does not require a separate turbine for backing. Electric propulsion has been adopted for seven battleships and five battle cruisers now being built for the U.S. Navy.

Thermo-Electric Effect by Throttling.—In a communication made to the Paris Academy of Sciences Mr. Karl Benediks mentions the following fact contrary to Magnus's law. In a homogeneous metallic circuit, a dissymmetric distribution of temperature gives rise to a thermo-E.M.F. He has sketched out a device which permits of increasing these forces somewhat in order to render them measurable with high-resistance low-sensitivity galvanometers. It was found, for example, that a cross of tungsten wires 0·22 mm. in diameter, heated with a micro-flame 5 mm. in height to a temperature estimated at 900° C., gave an E.M.F. of 19 millivolts, or about double that given by a platinum-rhodium thermo-couple (10 per cent.) for a temperature of 1,000° C. at the hot junction. Similarly by the contact of angular fragments of a ferro-silicon (50 per cent. silicon), considerable deviations took place—an important point for the theory of contact rectifiers used in wireless telegraphy.

In a later communication Mr. Benediks further dealt with this new thermo-electric effect, which may be considered as a reversal of the Thomson effect. He showed its extension to the liquid metals, like mercury, in which its sign conforms to that which is shown by theory. The direction of deviation changes with the sign of the magnetic field, in accordance with theory.

Appointments Vacant.—Sub-station attendant (49s.), for the Borough of West Hartlepool Electricity Department; mains assistant, for the Dover Corporation Electricity Works; senior and junior shift engineers, for Rotherham Corporation Electricity Department; shift engineers (50s. +), for the Borough of Oldham Electricity Department; switchboard attendant (35s. +) for the Bolton Corporation Electricity Department; switchboard attendant for the Gravesend Corporation Electricity Works; mains superintendent (63s. +) for the Bedford Corporation Electricity Department; switchboard attendant (48s.) for the Battersea B.C. Electricity Works. See advertisement pages to-day.

Lamp with Renewable Filament.—An incandescent lamp which can be readily re-charged with gas and fitted with a new filament is disclosed in U.S. Patent No. 1,232,741, issued to A. J. West, of Winnipeg, Manitoba. In this lamp, which is of the gas-filled type, there is no need for a vacuum, as it is only necessary to retain the gas in the globe under its own pressure. Accordingly, the lamp is so made that the globe can be removed to permit the renewal of the filament, and when the globe is attached to the head the joint is tight enough to retain the gas admitted. Further, in the head is provided an easy means for re-filling the lamp with gas, and retaining the gas. Upon the filament being rendered useless, the globe can readily be unscrewed from the head, and the filament withdrawn through the neck of the globe. After a new filament has been substituted, the globe can be replaced. At this time, however, it is necessary to re-charge the globe with gas. This is done by removing a screw plug and re-charging the globe with gas through a provided opening. Upon the globe being filled with the gas, it is screwed tightly in and the plug is inserted.—*Electrical World.*

Educational.—Middlesex.—The Education Committee has approved a scheme for the extension of day continuation classes in Edmonton and Tottenham for boys engaged in large engineering works. The classes will be held at Edmonton Technical Institute and the Tottenham Polytechnic. The manufacturers concerned are willing to liberate the boys for six hours a week during working hours, but suggested one evening session, to make a total of eight hours a week, for the session ending in May.

Spain.—An Institute of Electrical Industries has been established in Barcelona to impart instruction in the various branches of the electrical industry. The promoters have in view the great development which the electrical industries must take on in the near future.

The Nobel Prizes.—It has been decided by the Swedish Academy of Science not to award the Nobel Prize for physics and chemistry for the years 1916 and 1917. The prize for 1917 will be reserved until next year.—*The Times.*

Fatality.—Last week an employé of the Grove Dyeing Co., at Littleborough, died from the effect of an electric shock, apparently obtained on touching a machine; two other employés who went to his assistance also received shocks.

The Zurich Bank and the Depreciation of Foreign Investments.—As was recently mentioned in this journal, the prominent investment and underwriting company known as the Zurich Bank for Electrical Undertakings has only been able to declare a dividend at the rate of 5 per cent. for the year ended with June 30th, 1917, as compared with 8 per cent. each in 1915-16 and 1914-15, on ordinary share capital of £3,000,000, whereas in each of the two preceding years the rate was 10 per cent. on the same amount of capital, apart from meeting the interest on the loans which, in each of the years cited, were higher than the ordinary capital. Many of the bank's interests are situated in Italy, Germany, France, and other countries, and the depreciation of the currency in these countries under the influence of the war has, naturally, been felt by the bank. On this point the directors state that, owing to the unexpectedly large fall in the currency of all belligerent countries in relation to that of Switzerland, a considerable depreciation has taken place in the bank's credit and investments in foreign currency. The bank has, therefore, taken this into account by entering at the rates of exchange which prevailed on June 30th, 1917, all its current banking credit abroad of which the bank will be able to dispose at some future period. In the case, however, of the considerable amount of long-term advances made to the foreign undertakings closely associated with the bank, as well as the latter's investments in these undertakings, the directors announce that they have concluded agreements with friendly banking syndicates according to which, on a possible realisation of these holdings later on, a fixed rate of exchange has been guaranteed to the bank, which forms the basis upon which these assets have been entered in the books. These rates of exchange, it is stated, are certainly higher than those which prevailed in October of the present year, but they are still considerably below the normal rates founded upon the gold parity. Naturally, the guarantee operation has imposed a certain sacrifice on the bank through the general provision of the necessary equalising fund which is associated with it, but the directors state, on the other hand, that it has permitted the bank so to deal with its foreign assets that the proceeds could be fully placed in the year's accounts.

The Use of Formed Solder.—In manufacturing articles having many soldered joints difficult to reach, it is good practice to furnish the solder punched or formed to fit the seam, as the time, labour and solder saved are important considerations; moreover, the formed solder is more likely to reach every part of the seam and ensure a tight joint. An important manufacturer of automobiles makes use of a solder link stamped from a thin sheet of solder, in making radiators of the tubular type. The radiator element is built up of vertical rows of tubes pressed through thin copper plates. The ends of the tubes must be soldered tightly into the water chambers. The solder links are dropped over the ends of the rows of tubes and are melted with a blow-torch. The solder, being applied all around the tube in link form, runs down the tube to the tube sheet and makes a practically perfect soldered joint on five tubes simultaneously. It is obvious that much time is saved by the use of formed solder links in confined places like this; in fact, it would be practically impossible for the workman to apply solder to all the tubes in a reasonable length of time unless it were furnished him in the stamped shape.—*Machinery.*

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station and Tramway Officials.—On November 10th the staffs of the Lincoln electricity and tramways department presented a watch to the chief clerk, Mr. Stanley Saunders, who, after 20 years' service, is resigning to take up the position of senior clerk in the Salford Corporation electricity department. Mr. Stanley Clegg, the city electrical engineer, made the presentation.

Burton T.C. has accepted the resignation of Mr. James J. Cameron, chief assistant engineer at the electricity works.

Wimbledon T.C. has increased the salary of the borough electrical engineer from £500 to £600 a year.

Mr. Phillips, electrical engineer to the Bedford T.C., has joined the R.F.C., at the request of the Military authorities.

Mr. J. B. Hamilton, general manager of the Leeds Corporation tramways, who has for some months been Director of Trades Regulation under the Admiralty, has been invited by the Board of Trade to join the new Control Committee in connection with the tramway services of the country. The invitation to Mr. Hamilton was discussed at a meeting of the Leeds Tramways Committee on Monday, and it was decided to give him a free hand in regard to its acceptance. His new position will entail the resignation of the Admiralty appointment. Mr. Hamilton is at present Chairman of the Executive of the Municipal Tramways Association, three of whose members have been invited to membership of the new Control Committee.

Mr. H. F. C. Mitchell, who has been for 18 years mains inspector to the Derby Corporation, has been presented with a case of pipes and pouch on his leaving to take up the position of superintendent of mains and sub-stations for the British Cellulose Chemical Manufacturing Co., Ltd., Spondon, near Derby.

General.—Mr. G. C. Hamilton, M.P. for Altrincham, who will be remembered by electrical men as being formerly connected with Messrs. Drake & Gorham, Ltd., informs his constituents that he is unable to deal with any division matters, as he is taking up the organisation of the work of the R.F.C. in France, and will be away for some time.

Mr. W. Gibson has relinquished the post of manager of the Grand Theatre, Falkirk, to take up an appointment in the electrical department of Falkirk Iron Co.

Ald. A. R. Jephcott has been re-elected, for the fourth time, chairman of the Birmingham Corporation Electric Supply Committee.

Ald. Enoch Priestley and Coun. I. F. Ackroyd have been re-appointed chairman and vice-chairman of the Bradford Tramways Committee. Ald. G. H. Robinson has been appointed chairman of the Electricity Committee for the fifteenth time.

Ald. Marsland and Coun. Shires have been appointed chairman and deputy chairman of the Huddersfield Electricity Committee. The Tramways Committee has appointed Councillors Sellers and Canby.

Prof. C. G. Barkla, of Edinburgh, has been awarded the Hughes Medal of the Royal Society for his researches in connection with X-ray radiations.

On Wednesday, November 14th, at Ecclesall, Lieutenant Walter J. Cridge, 15th Sherwood Foresters, who is now attached to the Central Clearing House, Ministry of Munitions, was married to Honor Isabel (Belle), second daughter of Dr. W. Collier, of Ecclesall, Sheffield.

Coun. A. A. Thomson and Ald. G. J. Allen have been elected chairman and vice-chairman of the Croydon Corporation Tramways Committee respectively for the ensuing year.

Mr. Walter Allnutt, F.S.A.A., who has for many years held the post of secretary of Callender's Cable & Construction Co., Ltd., and the Anchor Cable Co., Ltd., has, in consequence of his advanced age and the necessity for obtaining greater leisure, requested the directors of those companies to release him from his engagement with them. The directors have acceded to his request, and have appointed Mr. Howard Foulds, who is at present secretary of the Electric Supply Committee of the Birmingham City Council, to fill the vacancy thus occassioned. Mr. Foulds will commence his duties as secretary of the above companies on January 1st next.

Roll of Honour.—Sec.-Lieut. L. P. Sidney, K.R.R.C., attached R.F.C., reported killed, aged 24, according to the *Times* studied in the National Physical Laboratory Testing Laboratories under Dr. Stanton, and in the Metallurgical Laboratories under Dr. Rosenhain. Subsequently he spent a year in iron and steel analysis with Mr. F. W. Harbord.

Private D. Morris, Manchester Regiment, killed in action, was employed by the Lancashire Dynamo & Motor Co., Ltd., Trafford Park.

Private W. Youel, Manchester Regiment, who has died of wounds, was an apprentice with Messrs. Lightfoot Bros., electrical engineers, Manchester.

Lance-Corporal H. Cooper, formerly a motorman on the Ashton-under-Lyne Corporation tramways, has been awarded

the Croix de Guerre, and also a bar to it, together with the Medal Militaire, for conspicuous bravery at the front.

Private G. R. Pemberton, Royal Warwickshire Regiment, of Aston, and A.B.S. Gregory, Royal Naval Detachment, Handsworth, former employés of the Electric & Ordnance Accessories Co., Birmingham, have fallen in action.

Lieutenant R. O. Gladstone, R.E., formerly on the outside construction staff at the B.T.H., Rugby, has been killed in action.

Private A. Jones, of the K.O. Royal Lancaster Regiment, killed in action, was formerly employed by Messrs. Lightfoot Bros., electrical engineers, Manchester.

Gunner F. Booth, R.F.A., killed in action, aged 25, was a former employé of the Chloride Electrical Storage Co., Ltd., Clifton Junction.

Privates J. Walker, wounded, J. Barker, wounded, H. West, wounded, and J. E. Allen, missing, were all former employés of the St. Helens Cable & Rubber Co., Warrington.

Private J. Kenworthy, Loyal North Lancashire Regiment, news of whose death in Mesopotamia has been received, was in the employ of Mr. E. Dewhurst, electrical engineer, Preston.

Bombardier G. Preston, R.F.A., who was employed as an electrician by Mr. G. Newby, Harrogate, has died of wounds.

Private T. Walton, N.F., who has been killed in action, was apprenticed as an electrical engineer with Mr. Pearson Rukin, Bradford.

A.B. W. A. Taylor, Nelson Division, who is suffering from gas poisoning, was employed by Mr. Fisher, electrician, Doncaster.

Corporal C. E. Hart, West Yorkshire Regiment, who has been missing since October 9th, was employed in the Leeds Corporation electricity department.

Lance-Corporal J. D. R. Heyes, of the King's (Liverpool) Regiment, killed in action, aged 22, was apprenticed with Mr. Fred Garnett, electrical engineer, Blackpool.

Lance-Corporal G. W. S. Whitfield, Manchester Regiment, killed in action, was in the employ of the Manchester Corporation electricity department.

Private J. Shaw, King's (Liverpool) Regiment, aged 23, killed in action, was employed by Messrs. Dick, Kerr & Co., Ltd., Preston.

The Military Medal for good work as a linesman under exceptionally hard conditions from time to time has been awarded to Sapper C. J. Eddy, R.E., who enlisted from the staff of the Kent Power Co., at Chatham.

Private F. H. Martyr, Queen's Royal West Surrey Regiment, killed in action, was on the staff of the British Westinghouse Co., Ltd.

Sapper S. A. Tyler, R.E., who has died in hospital at Chatham, was on the staff of Messrs. Belliss & Morcom, Ltd., Birmingham.

Sapper H. Chivers, R.E., who has died from wounds at Rouen, was a wireman with Mr. T. C. Bush, electrical engineer, of Bath.

Sergeant J. Ellis, R.A.M.C., killed in action, was for some years with the Potteries Electric Traction Co., Ltd., of Stoke-on-Trent. He had by gallantry gained the D.C.M. and a bar.

Corporal J. L. Carstairs, who has gained the Military Medal for bravery, was engaged in the East Greenwich generating station of the L.C.C.

NEW COMPANIES REGISTERED.

Staveley Electric Supply Co., Ltd. (148,900).—Private company. Registered November 16th. Capital, £5,000 in £1 shares. To carry on at Staveley and elsewhere in Derbyshire the business of an electric lighting and supply company, to provide electrical energy for any private or public purpose as defined by the Electric Lighting Act, 1882, &c. The subscribers (each with one share) are:—C. P. Markham, Ringwood, Chesterfield, ironmaster; J. Court, Staveley, Chesterfield, surgeon; C. W. Kendall, Staveley, Chesterfield, mineral water manufacturer. The first directors are:—C. P. Markham, J. Court, and C. W. Kendall. Solicitors: Stanton & Walker, Chesterfield.

W. & D. Conveyor Engineering Co., Ltd. (148,893).—Private company. Registered November 14th. Capital, £10,000 in £1 shares. Manufacturers of and dealers in labour-saving machinery in connection with the transport of goods, runways of all kinds, elevating machinery, humpers, stackers, and conveyors; electrical and general engineers, &c. The subscribers (each with one share) are:—H. O. King, Redlands, Badyr, near Cardiff, shipowner; M. Fletcher, 31, Great St. Helens, E.C., Lloyds' broker; W. H. Weguelin, Balholm, Chorley Wood, Herts., engineer; W. E. P. Doudney, 33, Playfield Crescent, East Dulwich, S.E., engineer. The first directors are:—H. O. King, T. Fletcher, W. H. Weguelin, W. E. P. Doudney, and C. H. Bennett. Solicitors: Downings, Crosby Buildings, E.C.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

General Cable Manufacturing Co., Ltd.—Debenture for £1,500, dated November 6th, 1917, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: T. Cohen and Co., Ltd., Spencer House, E.C.

CITY NOTES.

Monte Video Telephone Co., Ltd.

Mr. Chas. Lock presided at the annual meeting on November 19th. He said that the year's results were quite satisfactory, considering the difficult times. The subscriptions, rentals, &c., amounted to £78,402, against £72,000. The larger gross receipts were the result of an increase of 614 subscribers. Taxation showed a very substantial increase. There had been an increase in the actual amount of working expenses, but the actual percentage per subscriber showed a slight diminution, which was to the credit of the Monte Video management. With regard to the application for a concession for underground plant, last year he pointed out that, in view of the heavy cost of materials, the directors hoped that any grant of a concession would be delayed for some little time, and that the periods provided for in the concession for obtaining approval of the plans and raising the capital should be extended. Since then prices of materials had still further increased to an enormous extent, while it would be practically impossible for some time to come to place orders. Under these circumstances the only practical course was to suspend all idea for the present of undertaking an underground system. The cost at the present time, even if the materials were procurable—which was quite impossible—would be nearly three times as much as before the war, so that the net revenue of the company under present conditions would in no way suffice to provide an adequate return on the capital involved. It would also be quite impossible to obtain the sanction of the British Treasury for new capital for such an enterprise, so that their only reasonable course was to suspend this matter until times became more favourable. With regard to supplies, the Board had felt the necessity of looking ahead in these times, and they had managed to place orders which would give them supplies of the principal parts of their materials for at least 12 months to come.

Swiss Companies.

The report of the *Watt A.G. fur Elektrische Unternehmungen, of Glarus*, which is associated with the Zurich Bank for Electrical Undertakings, states that the company's activity in 1916-17 was limited to hitherto existing investments. These experienced a decline in the results, whilst at the same time large losses on the rate of exchange were incurred in the interest receipts in foreign currency. The accounts indicate net profits of £1,400, as compared with £9,800 in 1915-16, when a dividend of 3 per cent. was paid on the ordinary share capital of £300,000, but no distribution is possible for 1916-17.

The directors of the *Maschinen-Fabrik Oerlikon, of Oerlikon*, reporting on the year ended on June 30th, 1917, state that the scarcity of fuel resulted in the receipt by the department for machinery and transformers of considerable orders from industrial establishments, and the demand and turnover in special drives for the textile industry were very active. The great activity in the department for lighting apparatus and electro-mechanical applications continued, and sales were on the level of those in the preceding year, whilst the turbine branch was also well occupied. In the electric railway department the company had set in operation the equipment for the Biel-Tauffelen railway, and the delivery of the equipment for the London & North-Western Railway Co. was being carried out gradually. During the whole of the year the foundry for grey castings was fully occupied, and an increase took place in the orders received for forgings. The manufacture of fuses and shell cases was undertaken for the Swiss military authorities, but the company continued to refuse to supply war material to all belligerent countries. The accounts, after allocating £44,000 to depreciation, as contrasted with £43,000 in 1915-16, show net profits and balance forward of £43,000, as against £39,000 in the previous year. It is proposed to pay a dividend of 7 per cent. on the ordinary share capital of £320,000, being the same rate as in 1915-16. The directors now recommend an increase in the share capital to £640,000 by the issue of new shares, which will be offered to existing proprietors, the object being to provide additional capital for the further extension of the works in expectation of the development of business after the war.

German Companies.

The report of the *Elektro Werke A.G., of Berlin*, the financial ownership of which has now passed into the possession of the Government, states that the power station was fully completed in 1916-17, and the deliveries to the State nitrate works at Piesteritz amounted to 307,380,000 kw.-hours, and to 53,382,700 kw.-hours in the case of the Electro Nitrate works. At the end of the financial year the fuel requirements were being entirely satisfied by the output of the company's lignite mines, the average daily production being about 8,000 tons. The accounts show a loss of £1,700 for the year.

The A.E.G. Unternehmungen A.G., of Frankfort-on-Main, which originated from the A.E.G.-Lahmeyer Works, reports having disposed of shares in the Bergen (Norway) tramway at a large profit on the rate of exchange in 1916-17, and of £50,000 in shares in the Meissen tramway. On the other hand, a block of shares in the Linz-Urforr (Austria) tramway was purchased. The accounts exhibit net profits of £34,000, as against £33,000 in 1915-16, the rate of dividend

being 6 per cent. on share capital of £500,000, as in the previous year.

The Suddeutsche Telephon Apparatus, Kabel und Drahtwerke A.G., of Nuremburg, whose share capital of £50,000 is mostly held by the Felten & Guilleaume Co., report that a loan of £338,000 was raised in 1916-17 to defray the cost of extensions of the works and provide capital for the increased turnover. After making provision for depreciation to the extent of £19,000, as against £11,000 in 1915-16, the accounts indicate net profits of £27,000, as compared with £11,000. It is proposed to pay a dividend and bonus of 45 per cent., this contrasting with 20 per cent. and 10 per cent. in the two preceding years respectively.

The Rhein-Westfalisches Elektrizitats Werk A.G., of Essen, whose undertaking is one of the largest in the country, reports an increase in the connections and turnover in 1916-17 as a consequence of the great expansion in the war industries. Although the total number of glow-lamp connections was not very materially augmented, the number of motors rose from 38,000 in 1915-16 to 40,500 last year. The total value of the connections, including those of the company's associated undertakings, advanced from 400,000 KW. to 432,000 KW., and the deliveries expanded from 388,118,000 KW.-hours to 555,063,000 KW.-hours in the two years respectively. As a result of the growth in the working expenses various supply companies had raised their charges by up to 30 per cent., and the company would have to follow this example. The gross profits are returned at £606,000, as compared with £584,000 in 1915-16, and after apportioning £204,000 to depreciation, as against £186,000, the accounts exhibit net profits of £213,000, as contrasted with £222,000. It is intended to pay a dividend of 8 per cent. on the ordinary share capital of £2,500,000, being the same rate as in each of the five preceding years. The loan capital amounts to £1,760,000.

Cape Electric Tramways, Ltd.—For the year ended June 30th, 1917, the profit and loss account shows a profit of £79,893, and after providing for debenture interest and redemption, and including the balance brought forward, the net credit balance is £39,152, out of which £12,000 has been credited to reserve fund, and 5 per cent. is to be paid on the ordinary shares, leaving £2,591 to be carried forward. The passengers carried numbered 23,752,016, producing £231,106, against 22,477,366, producing £212,792 in the previous year. A satisfactory increase is shown both as regards the Cape Town and Port Elizabeth systems, attributable to the passing through of Australian and New Zealand troops and to the general prosperity throughout South Africa. The difficulties of obtaining supplies, and the high prices of all materials, as well as increased war bonuses to employés, keep the cost of operation at a high level. The expenditure is further increased by the additional taxation recently imposed by the Union Government, from which provision has had to be made. In spite of these difficulties the profit showed an increase of £6,225.

United Electric Tramways Co. of Caracas, Ltd.—As the local company has again declared a dividend absorbing its net profits for the year, the directors continue their policy, during the period of the war, of fully distributing amongst the shareholders the whole of the available net revenue. Out of the disposable balance of £13,799 a dividend is recommended at the same rate as last year (7 per cent., less income-tax), carrying forward £1,899.

Amazon Telegraph Co., Ltd.—The gross revenue for the year ended June 30th, 1917, was £72,144, and the working expenses were £31,539. After providing for income-tax and depreciation of investments, also £12,812 for debenture interest and £10,113 for sinking fund, £8,000 is placed to general reserve, 4 per cent. dividend, less tax, is paid, and £7,187 is to be carried forward.

Coalite, Ltd.—The "Morning Post" states that negotiations have for some time past been in progress for the exploitation of the company's patents. An agreement has now been concluded with Low Temperature Carbonisation, Ltd., under which that company is appointed manager of the business of Coalite, Ltd., for a term of 10 years from October 1st, 1917.

Callender's Share & Investment Trust, Ltd.—Dividend of 2½ per cent., less income-tax, for the half-year, making 5 per cent. for the year. After putting £500 to reserve, and £741 to writing off preliminary and debenture stock expenses, £5,279 is to be carried forward.

Calcutta Electric Supply Corporation, Ltd.—The number of units sold to consumers during the four weeks ended September 28th, 1917, has amounted to 2,354,138, compared with 2,156,682 units in the corresponding four weeks of 1916.

Stock Exchange Notice.—The undermentioned securities have been ordered to be quoted in the Official List:—

Melbourne Electric Supply Co., Ltd.—Further issue of £150,000 5 per cent. consolidated debenture stock.

France.—The Société des Ateliers Mécaniques et Electriques de Gennevilliers has just increased its capital to 3,500,000 francs.

Chloride Electrical Storage Co., Ltd.—Interim dividend on the ordinary shares, 5 per cent., free of tax.

British Ever-Ready Co., Ltd.—Dividend, 10 per cent. per annum on the ordinary shares for the half-year ended September.

Electric Construction Co., Ltd.—Dividend at the rate of 6 per cent. per annum on the ordinary shares, less income-tax, in respect of the year ending at March next.

Castner-Kellner Alkali Co., Ltd.—Dividend, 11 per cent. for the half-year ended September, making 20 per cent. for the year.

STOCKS AND SHARES.

TUESDAY EVENING.

THE Stock Exchange continues to move along cautious lines. Petrograd and Moscow are not providing light literature at present. The Italian rally, at the time of writing, is welcome, but interest awaits keenly the next developments. At home, the campaign which has begun in earnest in connection with the War Bonds is straitening purely investment business, though the War Loan and Consols keep good. Amongst the electricity markets, the feature is a continuance of activity, accompanied by rising prices, in shares of the manufacturing companies.

No further rumours have come to the ears of this individual column of the ELECTRICAL REVIEW, but hopes are more than keeping pace with the advance in prices that there is something in the air with reference to a combination of interests. Apart from this, however, it is declared by people who profess to know, that the electrical manufacturing companies are enjoying a good share of the prosperity attendant upon many other industries, upon which point the expert reader is likely to have better information than a mere financial echo. At all events, General Electric ordinary are 10s. better at 19—a splitting scheme would be highly acceptable to those who like to see a free market in any shares—while Electric Constructions are better at 23s. 9d. India-Rubbers rose 5s. to 14½. Edison Swan 7 per cent. first preference have been wanted at 21s. 3d., and the partly-paid at 16s. Cromptons moved back a little to 12s. 9d., and the preference are steady at 15s. 6d.

Lighting shares keep firm. There is still a demand for those of the principal London companies, but would-be buyers get tired of waiting after a time, and seek other investments if they cannot get those which they want at first. Charing Cross Ordinary have put on 5s., Kensingtons are ¼ up, and so are City of London preference.

In the telegraph market, Globe Ordinary are ¼ better at 13¾, but the Preference have lost a similar fraction at 10¼. Great Northerns recovered to 39. Western Telegraphs went back a little to 15. The Eastern group is steady. "China" shares changed hands the other day at 14⅞, and Eastern Telegraph Ordinary at 149; Eastern 3½ per cent. Preference at 61 and the 4 per cent. Mortgage Debenture stock at 73 have both been dealt in at these prices. The former stock at the present price returns 5¾ per cent. on the money. A good deal of business is being done in Oriental Telephones between 59s. 6d. and 62s. 6d., the middle price being advanced to £3 16s. United River Plate Telephones have been in some little request at 6 11/16. West India & Panama Preference are £8 for the Firsts and £7 for the Seconds, while the ordinary, ex the sixpenny dividend, are left at 1 7/16. Direct United States shares have lately changed hands at 6¾. Anglo-American Telegraph Preferred has attracted investment buying on the basis of 97. Marconi shares weakened to 3 3/16, the Preference also easing off to 2 9/16, with Americans lower at a guinea and Canadians at 10s. The recent severe slump in American rails in New York has, no doubt, something to do with the drop from 23s. in American Marconis, and this is affecting the parent shares. Another Stock Exchange case of the tail wagging the dog.

The railway market is uninteresting. No changes occurred in the electric stocks, though Districts are actually lower than they look from the nominal price of 16. British Electric Tractions are steady. London United Tramways Debenture stock gained attention at the end of last week, a fair number of bargains being done at about 35. London & Suburban Ordinary were bought at 2s. 9d. on Monday; the last recorded bargain in the 5 per cent. Preference was about a week ago at 7s. 4½d. The company's "A" Debenture stock is a little better at 80½.

Foreign issues are mainly dull, more particularly Mexicans. Mexican Light & Power Common remains at 22½, but the Preferred shed 4 points to 31, and the First Mortgage Bonds fell 2 to 40½. Brazil Tractions and British Columbia Electrics are fairly steady, and a conspicuous feature of strength is the 5 per cent. Debenture stock of the Anglo-Argentine Tramways, which has risen 3 to 71, in spite of circumstantial reports as to the outbreak of fresh labour trouble due to begin on one of the railways this week.

Castner-Kellner shares are ¼ up at 3 9/16, and other chemical shares are also strong. Babcock & Wilcox gained 5s. at 3 5/16, in a boomlet which has broken out amongst iron and steel shares generally, in which those of engineering companies have joined. Several companies have just lately pro-

posed the organisation of their capital accounts in such a manner as to afford shareholders a substantial bonus, and the boomlet referred to is based on the expectation that other concerns will follow suit by way of admitting their proprietors to a larger slice of profits than the former could receive in the shape of dividends, having regard to the excess profits duty. The rubber market is sticky, with the price of rubber showing a dullish tendency at half-a-crown per lb. Armaments hardened in sympathy with the iron and steel group.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1915.	Dividend 1916.	Price Nov. 20, 1917.	Rise or fall this week.	Yield p.c.
HOME ELECTRICITY COMPANIES.					
Brompton Ordinary	10	9	6¼	—	£6 18 6
Charing Cross Ordinary	5	5	4⅞	+ ⅛	5 17 8
do. do. do. 4½ Pref.	4½	4½	6⅝	—	6 18 4
Chelsea	4	5	5¼	—	5 9 1
City of London	8	8	15½	—	6 2 0
do. do. 6 per cent. Pref.	6	6	10½	—	5 18 6
County of London	7	7	11	—	6 7 3
do. 6 per cent. Pref.	6	6	10½	+ ⅛	5 18 5
Kensington Ordinary	7	6	6⅛	+ ⅛	5 11 7
London Electric	3	3	1	—	Nil
do. do. 6 per cent. Pref.	6	4	3½	—	5 6 8
Metropolitan	8	8	8½	—	4 12 4
do. 4½ per cent. Pref.	4½	4½	6¼	—	7 4 0
St. James' and Pall Mall	8	8	7	—	5 14 6
South London	5	5	5	—	6 18 4
South Metropolitan Pref.	7	7	21/8	—	6 10 6
Westminster Ordinary	7	7	6¼	—	5 3 3
TELEGRAPHS AND TELEPHONES.					
Anglo-Am. Tel. Pref.	6	6	97	—	6 3 9
do. Def.	83/8	1½	12½	—	6 9 0
Chile Telephone	6	6	7⅞	—	5 11 4
Cuba Sub. Ord.	8	7	6⅞	—	*8 0 0
Eastern Extension	8	8	14⅞	—	*5 7 9
Eastern Tel. Ord.	8	8	149¾	—	*5 7 0
Globe Tel. and T. Ord.	7	7	13½	+ ⅛	*5 4 8
do. Pref.	6	6	10½	— ⅛	5 17 1
Great Northern Tel.	22	24	39	+ ½	6 1 8
Indo-European	12	12	22½	—	6 13 10
Marconi	10	15	3⅞	— 1/16	4 14 1
Oriental Telephone Ord.	10	10	8⅞	+ 1/16	5 5 4
United R. Plate Tel.	8	8	6⅞	—	*5 16 6
West India and Pan.	6d.	6d.	1 1/16 xd	+6d.	*3 9 6
Western Telegraph	7	8	15	— ¼	*5 6 8
HOME RAILS.					
Central London, Ord. Assented	4	4	60½	—	6 12 9
Metropolitan	1	1	23	—	4 7 0
do. District	Nil	Nil	16	—	Nil
Underground Electric Ordinary	Nil	Nil	1⅛	—	Nil
do. do. "A"	Nil	Nil	6/8	—	Nil
do. do. Income	6	4	82	—	*4 17 5
FOREIGN TRAMS, &c.					
	Dividend 1915.	Dividend 1916.			
Adelaide Sup. 6 per cent. Pref.	6	6	4⅞	—	6 3 1
Anglo-Arg. Trams, First Pref.	5¼	5¼	8	—	9 3 4
do. 2nd Pref.	5¼	—	2¼	—	—
do. 5 Deb.	5	5	71	+3	7 0 0
Brazil Tractions	4	4	43	—	—
Bombay Electric Pref.	6	6	9⅞	—	6 3 1
British Columbia Elec. Rly. Pfcs.	5	5	42½	—	11 18 2
do. do. Preferred	Nil	Nil	30	—	Nil
do. do. Deferred	Nil	Nil	26	—	Nil
do. do. Deb.	4½	4½	65½	—	7 14 7
Mexico Trams 5 per cent. Bonds	Nil	Nil	44½	—	Nil
do. 6 per cent. Bonds	Nil	Nil	38	—	Nil
Mexican Light Common	Nil	Nil	22½	—	Nil
do. Pref.	Nil	Nil	31	—4	Nil
do. 1st Bonds	Nil	Nil	40½	—2	—
MANUFACTURING COMPANIES.					
Babcock & Wilcox	15	15	3 5/8 xd	+ ¼	4 10 8
British Aluminium Ord.	7	10	1⅛	—	6 5 5
British Insulated Ord.	17½	20	3	—	6 13 4
British Westinghouse Pref.	7½	7½	2⅞	— 1/16	5 4 4
Callenders	20	20	14⅜	—	6 18 0
do. 5 Pref.	6	6	4¼	—	6 1 8
Castner-Kellner	22	22	3 5/8	+ ¼	6 3 8
Edison Swan, fully paid	—	—	2½	—	Nil
do. do. 4 per cent. Deb.	4	4	7⅛	—	5 7 5
Electric Construction	7½	7½	1 7/8	+ 1/16	6 6 4
Gen. Elec. Pref.	5	5	10½	—	5 14 3
do. Ord.	10	10	19	+ ½	5 5 3
Henley	25	25	15½	—	7 18 3
do. 4½ Pref.	4½	4½	4	—	5 12 6
India-Rubber	10	10	14⅜	+ ¼	*6 19 2
Telegraph Con.	20	20	41	—	*5 17 0

* Dividends paid free of income-tax.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Month ended (4 wks.)	Receipts for the month. £	Increase £	No. of weeks.	Total to date. £	Increase £	Route miles open.	Increase
Bristol	Oct. 26	21,620	+1,581	43	239,041	+20,985	10·5	..
Cork	" 28	2,247	+ 196	43	23,708	+ 1,574	9·89	..
Dublin	" 26	27,995	+1,691	43	295,749	+27,982	54·25	..
Hastings	" 24	4,781	+ 949	43	54,485	+ 8,868	19·3	..
Lancashire United	" 31	9,589	+3,175	44	109,198	+22,591	42	..
Llandudno-Col. Bay	" 26	1,252	+ 69	47½	16,855	— 902	6·5	..
Anglo-Argentine	" 31	215,591	+2,945	44	2,318,941	+27,709	..	..
Auckland	" 26	22,308	+ 880	17	93,118	+ 7,882	26·40	..
Calcutta	" 27	18,463	+ 296	..	..	+ 1,930	..	..
Kalgoorlie, W.A.	July	2,719	..	31	18,154	+ 8,868	20.5	..
Madras	Sept. 30	4,695	..	31	41,699	+ 2,691	..	..
Montevideo	Oct.	30,153	+1,494	53	959,803	+12,060	..	..

MARKET QUOTATIONS.

IT should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and they may vary according to quantities and other circumstances.

Wednesday, November 21st.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Oxalic	per lb.	1/6	..
a Ammoniac Sal	per ton	£75	..
a Ammonia, Muriate (large crystal)	"	£58	..
a Bisulphide of Carbon	"	£30	..
a Borax	"	£36	..
a Copper Sulphate	"	£66	..
a Potash, Chlorate	per lb.	1/8	..
a " Perchlorate	"	2/-	..
a Shellac	per cwt.	£15 10	..
a Sulphate of Magnesia	per ton	£16	..
a Sulphur, Sublimed Flowers	"	£35	..
a " Lump	"	£25	..
a Soda, Chlorate	per lb.	10½d.	..
a " Crystals	per ton	12£/-	..
a Sodium Bichromate, casks	per lb.	..	..
METALS, &c.			
c Brass (rolled metal 2' to 12' bahis)	per lb.	..	..
c " Tubes (solid drawn)	"	..	..
c " Wire, basis	"	..	..
c Copper Tubes (solid drawn)	"	1/6½ to 1/7	..
g " Bars (best selected)	per ton	£150	..
g " Sheet	"	£150	..
g " Rod	"	£150	..
d " (Electrolytic) Bars	"	£135	..
d " " Sheets	"	£159	..
d " " Wire Rods	"	£138	..
d " " H.C. Wire	per lb.	1/8½	..
f Ebonite Rod	"	9/-	..
f " Sheet	"	9/6	..
n German Silver Wire	"	2/3	..
h Gutta-percha, fine	"	6/10	..
h India-rubber, Para fine	"	3/5½	..
i Iron Pig (Cleveland warrants)	per ton	Nom.	..
l " Wire, galv. No. 8, P.O. qual.	"	£49	..
g Lead, English Pig	"	..	..
g Mercury	per bot.	Nom.	..
e Mica (in original cases) small	per lb.	6d. to 2/-	..
e " " " medium	"	2/6 to 6/-	..
e " " " large	"	7/6 to 14/- & up.	..
d Silicium Bronze Wire	per lb.	1/6½	..
r Steel, Magnet, in bars	per ton	..	..
g Tin, Block (English)	"	..	..
n " Wire, Nos. 1 to 16	per lb.	3/9	3d. inc.

Quotations supplied by—

a G. Boor & Co.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
r W. F. Dennis & Co.

German Central-Station Tariffs.—A recent communication from the Elektrizitätswirtschaftsstelle (Electricity Administration) to the *E.T.Z.*, discusses the grounds upon which central stations are entitled to increase their charges for electrical energy. The price of coal has risen by 100 per cent. or more, that of other working materials has risen by several hundreds per cent., and wages have risen to an extraordinary level since the beginning of the war. Voluntary allowances to dependents of workmen called to the Colours represent a further heavy burden on practically every electricity undertaking. Bulk consumers are therefore urged to pay a higher price for energy, in proportion to the increased cost of production, even where long-term contracts give them a legal right to a supply at pre-war prices. Another respect in which central stations are hard hit is in loss of revenue owing to:—(1) The introduction of "summer-time." (2) Restricted use of light and power on grounds of economy or due to small works being closed. (3) Absence on active service of innumerable small consumers. It is pointed out that the effective maintenance (financial and material) of electricity and gas works is a matter of national importance, also that these concerns are at present subject to abnormal depreciation as well as increased working costs. For some time after the war, renewals will be very costly, and allowing for all these factors, a 25 per cent. increase in the selling price of energy is none too much

Cracking Hydrocarbon Vapours by Electricity.—A process that aims to obtain by means of an electric discharge a greater yield of fixed gases from hydrocarbon vapours, is the development of J. G. Davidson and R. W. Ford, of Vancouver, B.C., Canada. Patent No. 1,229,042 has been granted covering the discovery that by passing such vapours through an electric brush discharge field, the amount of non-condensable gases is increased. In actual tests it is claimed that by this process the amount of CH_4 in the gas has been increased from about 25 per cent. to approximately 40 per cent., while the amounts of C_nH_{2n} were increased from between 7 per cent. and 10 per cent. to between 20 per cent. and 23 per cent. Ordinarily the gas is conducted through a plurality of conduits formed as vertical pipes connected at their lower ends to a supply header and at their upper ends to an outlet header, the discharge electrodes being formed of wires hung axially in the pipes from an insulated support. The pipes are grounded and the electrodes are connected by a wire to a mechanical rectifier of the usual rotary type included in the high-tension circuit of a step-up transformer, the other pole of the rectifier being connected to ground.—*Electrical World.*

THE INSTITUTION OF ELECTRICAL ENGINEERS.

Abstract of the Inaugural Address delivered by Mr. C. H. Wordingham, *President, November 8th*, 1917.

(*Continued from page* 480.)

Research.

With a strong Institution such as I have depicted, the field of usefulness would be enormous, and the potentialities almost beyond calculation. One of the most important matters demanding attention is research. Scientific research on purely academic lines should be closely pursued, for it is from such work, having apparently no commercial application, that the industry itself and many of its most lucrative developments have sprung. Equally important is industrial research, by which I understand the development of scientific discoveries and new methods of manufacture.

The point I wish to make is that the workers at both kinds of research should be welded together so as to assist one another, and so that the manufacturers may have a call on the highest talent in the country, while the scientific seeker after discoveries may avail himself of the resources of the manufacturers to test any promising inventions he may make. Such co-operation must tend to give far better results than any independent efforts of one class of worker without the other.

In the National Physical Laboratory we have magnificent facilities for scientific investigation of the highest class, and now that it has been taken over by the Advisory Council for Scientific and Industrial Research it may be hoped that it will in future be supplied with adequate funds by the Government.

Industrial research stands on a very different footing in every way. If industrial research is to be of real value to the nation it is essential that much of the work done shall be kept secret, and only imparted to those who will directly utilise the information obtained for the benefit of British trade. Fortunately, this has been recognised from the first by the Advisory Council of Research, and much valuable work has been, and is being, done to enable British manufacturers to produce articles formerly obtained from abroad, such articles in many cases being of superior quality to the foreign ones.

If new discoveries or processes are obtained by the employment of public funds, it may be argued that they should be the property of the nation; on the other hand, the funds would have been of no avail without the genius of the discoverer, and he is obviously entitled to a substantial share of whatever profit is made.

Industrial differs from purely scientific research also in the scale and, in consequence, the cost of experiment. The concentration of the manufacturing interests in the hands of one or two gigantic companies in America and Germany has enabled those companies to develop their facilities for research to an extent that is clearly impossible in this country, where a much smaller volume of manufacture is conducted by a multiplicity of firms. In consequence, what facilities exist for industrial research are partial, unco-ordinated, duplicated, and incomplete. There is, therefore, a crying need for the establishment of one or more fully equipped laboratories on a large scale for the investigation of industrial problems. Such laboratories will need the generous support of the Government and the manufacturers.

Much research and many discoveries have taken place here in spite of the unfavourable conditions. The cleverness of the Germans, of which we have heard *ad nauseam*, has lain not in their originality or inventiveness, but in their quickness in appropriating other people's inventions; they have provided the money to tempt away to Germany the English inventor whose work was received with coldness and suspicion by those of his fellow countrymen possessing the capital necessary to secure the fruits of his labour, and who would not provide the funds. Hundreds of cases could be cited in illustration. I may mention one that came under my notice quite recently. A material widely used in electrical apparatus could before the war only be obtained from Germany. A firm of manufacturers in this country discovered that the whole of the plant and process for producing this material was the invention of an Englishman; they were fortunate enough to get into touch with him, with the result that they are now putting down plant which is a duplicate of that which he had designed for his German employers, and the material will now be made in this country of exactly the same quality as, or probably better than, that formerly only obtainable from Germany. We have the discoverers and inventors in this country, and always have had them; if we given them facilities as good as those possessed by our rivals, and back them up with financial support, the possibilities before us are unlimited—but we must do both.

A consideration of laboratories leads me to another matter to which I have already very briefly alluded, namely, the establishment of an institution which shall be in a position to say authoritatively whether certain standards have been complied with, and to give a hall-mark to British manufactures. It has long been a cherished ambition of mine to see established such an institution, for which I have suggested the name of National Electrical Proving House. In 1899 I read a paper before the Institution in the course of which I described a local attempt which I had made, with a considerable measure of success, to test samples of fuses, switches, and similar fittings with a view to certifying that they reached a certain standard of excellence, and I strongly advocated that the Institution should take the matter up and carry out the idea on national instead of local lines. My proposals, however, met with considerable opposition, and nothing was done. Previous to 1913 a serious situation had arisen in connection with British trade in Canada on account of the non-existence of such an authority as I have indicated, British manufacturers having to send their goods to Chicago to be tested and passed before they could be sold in British Canada! In view of this, the Council referred the matter to a special committee, but owing to the outbreak of war the question had to stand over. After waiting for about a year and a half I sent to the technical Press, with the sanction of the then President, the proposals which I had wished to make to the Committee. I had outlined a definite scheme, and my proposals met with considerable support, and were favourably received by the I.M.E.A. and the B.E.A.M.A., but nothing happened. Since the war, the reality of the need which I first pointed out 18 years ago has been appreciated, and there is clear indication that the proposal commends itself to manufacturers and, with a courtesy and consideration which I highly appreciate, members of the B.E.A.M.A. have asked me to bring the matter forward at the Institution during my year of office. A Committee of the Council has already been instructed to report on the matter, and has recommended the setting up of a committee representing the interests concerned. When this committee has drafted outline proposals an opportunity will be given for the matter to be fully discussed by the general body of members, after which I hope that definite and adequate steps may be taken before the close of the session to set up an authority which shall be able to certify whether an article is or is not in conformity with a given standard of excellence, and shall give it a hall-mark which shall be recognised throughout the world as a guarantee of British origin and British excellence and reliability.

Influence of the War.

The political measures for the furtherance of trade can find no place in an address such as this. I will only remark that while the potentialities for good immanent in the Government are enormous, they should be directed towards assisting industries, and not be employed in interfering with them. Each industry knows best its own business and requirements, and how its interests can be furthered.

Nationalisation of certain industries is not infrequently mooted, but I venture to think that in no case should the Government undertake any business of a commercial nature. It starts with the handicap of being regarded by most as the legitimate prey of all who can get the better of it, and it is further handicapped by the impossibility of employing those methods which make for success in obtaining business and executing it satisfactorily. I refer more especially to individual effort and initiative, untrammelled power for those engaged in the work to decide and act quickly, freedom and secrecy in negotiations, and finally the important and perfectly proper incentive of personal profit.

The chief ways in which Government can assist industry are the safeguarding of British interests abroad, so that the British trader may be at least on an equal footing with those of other nationalities in foreign markets; the shielding of young industries in this country from foreign competition during the period of their infancy, and from unfair and State-aided competition when adolescent; the conservation of natural products of the Empire for the exclusive use of British manufacturers up to the maximum quantities required by them, due regard being paid also to a reasonable extent to deferring ultimate exhaustion; the removal of all obstructive and injurious legislation; and, finally, the collection of really useful information as to foreign markets not available to traders by their own unaided efforts, and its dissemination without delay among those concerned. I have already indicated the good that I think might be done by the Government in connection with engineering by conferring wider powers on the existing engineering institutions.

The problem of the promotion of British trade after the war is one which has come in for an immense amount of consideration and a much greater amount of talk. There is a strong tendency to co-operation and federation, with a unification of organisation that must bring about a powerful body representing British trade.

In deliberating upon the action to be taken, every effort must be made to give due weight to each consideration, and to avoid turning a principle eminently true and valuable into a shibboleth and pushing it to such an extent that, in place of being beneficial, it becomes mischievous. I believe the keynote of our success in the future to be co-operation and federation. The same principle is capable of application on a still grander scale, and having already federation among our own Dominions, may we not hope that our alliance with the other great branch of the Anglo-Saxon race may not be for the time of the war only, but that some way may be found, if not of actual federation, at all events of working together in harmony for the good of our branch of the human race, and opposing those nations who have shown their whole nature, ideals, and methods to be antagonistic to our own.

and of combating dangers of which the embryo is only faintly discerned at present, but which in the fullness of time may threaten our very existence.

While it is imperative that combination should be effected among manufacturers for the promotion of the Empire's world trade, in combining let us not forget it is the individualism of the Briton which has brought him into the position that he occupies in the world. Combination should be effected on lines which will recognise the British characteristic of individuality. The autocratic and machine-like methods of training suitable for the German cannot be successfully applied to the British manufacturer, who does best when he retains his own initiative and individuality. There is every indication that combination will be effected on lines which will not crush out the small manufacturer, and which will enable combinations of firms to be made in such a manner that the orders are obtained by a common organisation while the work is carried out in individual factories, each factory taking that portion for which it is best suited.

There is one danger to our trade which I greatly fear, and which will be realised unless we as individuals can rise above our own selfish immediate apparent interests, and can consider the good of the nation as a whole. The outbreak of war probably took all of us by surprise, but not the subsequent demonstration of the depths of degredation of the German mind and soul. To many of us the whole tendency of modern German thought and aspiration, and the German methods of commerce were wholly and utterly repulsive, and many of us were fully alive to the danger to which this country was exposed by the insane encouragement given to the import of German manufactures and the fatuous belief in German superiority. The eyes of many have been opened, but whether the awakening is permanent time alone can show. Never was the warning "Lest we forget" more necessary than now. Let us remember that the leopard does not change his spots, and, once the sheep's clothing has been stripped off, let us never again be deceived by the artificial exterior, however woolly and lamblike it may appear; the spots are still there. Let us not be deceived. The German has been our deadly enemy for many years past, he has been our open enemy during the last three years, and nothing has occurred which can render it in the least degree probable that he will become anything less of an enemy in the future. Let every man who is tempted, as he will be tempted, and tempted very strongly, in the near future to fall back into his old reliance on German produce, remember that in yielding on account of what appears to him to be his immediate commercial advantage he is showing himself to be a traitor to his country, and is ultimately assisting in his own downfall. If this nation is to survive in the industrial war on which we must shortly enter, it can only do so by recognising its enemies, and by its individuals holding together and supporting each other's efforts for the common welfare. Let the first question asked when dealing with a firm be, "Is it British?" and if it be not, then let one be sought that is. It may be contended that in many branches of the industry the British-produced article is inferior to, as well as dearer than, the German. If we assume this to be true, the obvious line of action is to take steps to improve the manufacture of that article, and to give those who make it a market to supply; the British manufacturer will very soon rise to the occasion, and rapidly pass his German competitor if only he be given the chance.

The war has powerfully affected Capital and Labour individually and their mutual relations. The expenditure on warlike material, coupled with a great reduction in the ratio of exports to imports, has impoverished the nation, and driven large amounts of capital into other hands than ours. The result will be that many of the profitable enterprises presenting themselves after the war will have to be financed in large measure by foreign capital. This is a danger that must be watched closely, for it will greatly mar the value of the expansion of our trade if the profits go out of the country, and it will obviously retard progress seriously if they are not available for the nourishment of our own business.

There is, however, an encouraging feature in connection with the effect of the war on capital, namely, the bringing home to most what was already known to many, that our industry was strangled for want of financial support, more especially in connection with new inventions which, while involving risks, contain also vast possibilities. We may hope that broader and wiser views will prevail in future, and that British capital will to a much larger extent be applied to the development of British trade, instead of being sent abroad to provide the sinews of war for the foreigner to attack our trade.

It is in Labour probably that the most tremendous problem of the immediate future resides. The power and influence in the hands of the workman have been demonstrated in an unmistakable manner. The stress of war, and the necessity for increased production have cast a lurid light on the methods adopted by the workmen in their supposed interests in times before the war. Neither masters nor men are likely to put up with their relations with one another being interfered with by outside authorities even so exalted as the Government, when once the war is over, and the fate of industry will depend upon how the acutely difficult problems are faced and dealt with by the two parties concerned.

The extraordinary development of women's labour raises issues that are intricate and new. Having tasted independence and high wages, a number of those now working will desire to continue their present activities, and probably this will be bitterly opposed by the men, but I do not believe that there will be any great access of women permanently to the ranks of engineering workers. Women are physically unfit to endure the heavy work inseparable from most engineering operations; they may support it for a time, but, if persevered in, the results can hardly fail to be disastrous.

The upheaval that has taken place has probably so affected men's minds that they will be able to approach the matter with far more hope of success than if their ideas had remained stereotyped. Unquestionably mistakes have been made, and the rank and file have often been misguided, but there have been many reprehensible actions on the part of the employers, and the men's attitude has not always been without strong provocation. No one can listen to the speeches of some of the Labour leaders and be acquainted with their personalities without recognising the marked ability and honesty of purpose of many of them. Certainly, all those who have had direct dealings with workmen themselves must acknowledge that as individuals many command respect for their general character as men and their ability as workmen. That there is serious unrest at present is certain, and much of it has been traced to causes that give reasonable grounds for its existence.

It is quite certain that the men will have to be given a much greater share in the management and profits of the undertakings they are engaged on. It is equally certain that they are not at present fit to occupy the position that the importance of their contribution to the country's wealth justifies. They must be taught that they have duties as well as rights; they must be educated to take an intelligent interest in their work and in its development; their prejudices, ignorance, and suspicion must be broken down, and many serious misconceptions cleared away. Masters must learn that they themselves must do what they enjoin on their men; they must remove their own ignorance of the conditions of life and of the viewpoint of their men, and they must get rid of the suspicion that they entertain of the men, which is just as great, and perhaps as ill-founded, as the men's suspicion of them. While asking the men to deal fairly with them they must see to it that they set the example of fairness.

Unless masters and men can succeed in understanding and trusting one another, and in working together for the common good, this nation must go under in the industrial strife before us.

I believe success is to be attained by giving each man in some way or another a direct interest in the financial results of the concern employing him; by letting him have some say in its management; by treating him as a man, and not as a machine; by letting individuality have play; by ensuring that every man, even though not brilliant, shall if he works steadily be decently housed, clothed, and fed; by shielding men from coercion by their fellows, tending to reduce their efficiency; and by promoting in every way mutual regard and trust between employers and employed.

(To be concluded.)

Newcastle-upon-Tyne Local Section.

The first meeting of the current session of the Newcastle Local Section was held on November 12th, at the Mining Institute, Newcastle. Mr. H. W. Clothier, the retiring chairman, made reference to the death of Mr. Duddell, whom he characterised as one of the most brilliant men in the electrical industry, who took so great a part in the electrical problems connected with the war that he absolutely wore himself out. He also made an urgent appeal on behalf of the Volunteers for the signalling corps of which men were wanted, and announced that one of their members, Acting-Major Geo. Stamp Taylor, R.E., had been decorated with the Military Cross. He was formerly connected with the electrical service of the North-Eastern Railway Co.

Mr. A. H. Marshall (Middlesbrough), the new chairman, said that recently nothing had stood out so prominently as the necessity of a better utilisation of our coal supplies and the giving of a cheap supply of power to the industries of the country, and he purposed to discuss the use of electricity and its bearing on fuel-saving in the iron and steel trades; it seemed to him that it was with those trades that the electrical industry would be associated for its greatest development in the immediate future. There was every indication that the next few years would see a greater combination of interests, better application of capital, and the utilisation of every means to economy. This must result in the extended employment of electricity. With efficient plant and means for the recovery of surplus heat, it was commercially possible to supply all the heat and power requirements of a works that was laid out complete with coke-ovens, blast furnaces, steel furnaces, and mills, from the combustion of the coal fed into the coke-ovens. This was an ideal arrangement which had been aimed at, but not attained, because even the largest undertakings had not been able either to dispense with their coal-fired heating plant or to justify the capital expenditure necessary to make full use of their waste energy. But such an economical arrangement could be obtained if one applied the advantages of linking-up to the electrical end. The idea that there were enormous quantities of gas and waste heat which could be converted into electrical energy and used for outside purposes, was a misunderstanding. It was only by taking full advantage of every means available for heat

recovery that there was any margin of power to spare in a properly co-ordinated undertaking. He submitted the following figures showing how the energy of the coal as fed to the coke ovens was distributed in the process of coking, smelting, and steel making. The energy values were expressed in Kelvins (KW.-hours), and he was dealing with the conditions of iron and steel manufacture on the North-East Coast, taking as a basis 1 ton of ordinary Durham coking coal, having a value of 12,500 B.TH.U.

TABLE I.

DISTRIBUTION OF ENERGY IN 1 TON COAL, 12,500 B.TH.U. CONTAINING 8,200 KELVINS.

Quantity of product.	Carbonising 1 ton of coal.	Kelvins applicable for conversion to power.
5,500 cb. ft.	Gas used on ovens ...	690 —
5,000 cb. ft.	Gas surplus	630 —
·7 ton	Coke	6,000 —
·05 ton	Coke breeze	300 —
100 lb.	Tar	470 350
2½ gallons	Benzol	110 —
		8,200
	Smelting ·64 ton pig-iron.	
31,700 cb. ft.	Gas used on stoves ...	930 —
73,800 cb. ft.	Gas surplus	2,160 —
1 ton	Slag (sensible heat)...	650 650
·64 ton	Pig-iron (sensible heat)	250 —
	Furnace react'ns & loss	2,010 —
		6,000
	UTILISATION OF SURPLUS GAS FROM COKE OVENS AND BLAST FURNACES.	
	Making steel (·68 ton)	1,200 300
	Reheating ingots (do.)	390 —
	Balance	1,200 1,200
		2,790 2,500
	CONVERSION TO ELECTRICAL OR MECHANICAL POWER.	
	Total available energy	2,500
	Less slag value	650
		1,850
	Thermal efficiency	15 %
	1,850 × ·15 = 280 KW.-hours per ton of coal.	

In order to fix the idea, he took the case of a group of works equipped with four 70-oven batteries, consuming 8,700 tons per week, five blast furnaces each making 1,100 tons of pig per week, and sufficient open-hearth steel furnace capacity and rolling mill plant to convert the whole of the pig-iron make into finished steel sections; 8,700 tons of coal per week was, at a steady rate of consumption, approximately 50 tons per hour.

TABLE II.

KW. OUTPUT.

Coal consumed per hour...		50 tons.
Electrical energy per ton of coal	...	280 Kelvins.
Nominal output, 280 × 50	=	14,000 KW.
Minimum output, 14,000 × ·6	=	8,400 KW.
Average output, 14,000 × ·85	=	11,900 KW.

KW. LOAD.

	Units required per ton of coal.	Mean KW.	Load factor.	Max. KW.
Coke oven auxiliaries Blast furnace do. Steel furnace do.	40 × 50	2,000 at	·6	3,300
Blowing plant (120 × ·64)	77 × 50	3,800 at	·9	4,200
Rolling mills (110 × ·68)	75 × 50	3,700 at	·6	6,500
		9,500		14,000
Average output units per week,	11,900 × 168	=		2,000,000
Consumption do.	9,500 × 168	=		1,600,000
Surplus				400,000

This table shows the power consumed at the works.

The coke-oven results were those obtained with any well-known make of by-product regenerative oven, operated under ordinary commercial conditions. Mr. Marshall referred to the present state of things to show what scope there was for an improvement from the point of view of fuel economy. In old-established Cleveland practice the surplus heat from the blast furnaces was converted into power by means of shell-type boilers in open settings and non-condensing steam engines at a thermal efficiency of about 5 per cent., and as a consequence there was generally little gas to spare. The exhaust steam turbine, in a good many cases, had improved the thermal economy by another 5 per cent. It was here that the power companies had been able to effect a very considerable saving of coal, while the advantages to the ironmasters had been great, not alone from the payment they received for what otherwise would be a waste product, but by getting the steam returned to them in the form of water. The advantages claimed for the electrical reversing mill had been well substantiated in practice, as was borne out by the fact that there were at present under construction at least seven reversing mill equipments, ranging from 10,000 to 20,000 H.P. in size, capable of doing the heaviest class of work, both roughing and finishing, with outputs of over 50 tons per hour. These new mills would altogether have a capacity of well over 1,000,000 tons of steel per annum. In addition, there were numerous A.C. motor continuous mill drives being installed, in sizes of from 2,000 to 10,000 H.P. An application of electricity which had not received the attention it deserved was that of locomotive haulage for shunting purposes in such cases as they were considering, where probably there would be 12 locomotives in commission consuming 4,800 tons of coal per annum. On a very close estimate of work done, the thermal efficiency came out well below 1 per cent. The total consumption by steel works in the country for this purpose alone, on the same basis, was 160,000 tons per annum; taking for electrical driving a thermal efficiency to the motors of 10 per cent., there would be a saving of over 140,000 tons per annum. The most recent electrical development in steelworks practice, and one which had received a great impetus from the war, was the electric furnace, which was working very successfully.

What he had tried to show was that there was, on a commercial basis, sufficient energy in the coal required for the blast-furnace coke to perform all the various operations, thermal and mechanical, in and about an iron and steel works, but that owing to the large and sudden fuel variations, there must be a standing plant capacity at hand for immediate use, and also a means for consuming what surplus energy there was available. Only in this way was it possible to obtain the full and safe use of all the heat energy of the coal at low capital cost. Until such time as there was sufficient co-ordination of coke ovens, blast furnaces, and steel works to avoid the destructive burning of coal, it was evident that a linked-up electrical system was still more necessary for picking up the waste heat wherever it might be found, and passing it on to where it might be used. That was what, to a great extent, had already been done by the power companies. As an illustration of the scope of future electrical development, the total electrical energy to be dealt with, on the figures he had put before them, assuming them to apply to a make of steel of 14,000,000 tons, which, according to Dr. Addison, was what next year's output would amount to, and not counting the power taken by the blowing plant, worked out at 3,300,000,000 units per annum, with a maximum load of over 600,000 KW. In conclusion, he said it was somewhat surprising, considering the dependence of any fuel economy scheme upon electrical means for its realisation, how little that Institution had been identified with the enormous possibilities of electrical expansion, which had stood ready to hand at any time for the past 20 years. It was to be hoped that in future a great technical institution like theirs would have more influence on capital enterprise, and would carry more weight with the men responsible for the government of the country.

THE STATE OF TRADE.

BY "COMMERCIAL."

THE prospect of the war continuing for an indefinite period to come has naturally prompted the commercial leaders of the staple pre-war industries of the country to seriously review the present situation of trade and its future outlook. In the opinion of a great many of those who are in the best position to judge, the situation, to say the least of it, is far from reassuring.

During the past 12 months the conditions under which trade has laboured have been beset with so many unforeseen difficulties, and the essential basic principles upon which a business is governed have become so perverted, that to obtain a correct view of the state of trade throughout the country has proved almost a hopeless task. Yet we are strongly of the opinion of these commercial leaders themselves, that to carry on indefinitely under a false sense of prosperity created by new and passing conditions, while the old and proven sources of industry are allowed to pass out of control, as a result of outside interference, incompetence, and neglect, is to subscribe to a system that is as ruinous in effect as it is short-sighted in policy.

After making the fullest allowances for the abnormal conditions brought about by the exigencies of war, the conviction continually thrusts itself forward that too often the interests of trade are being sacrificed to the dictates and mandates of an inexperienced body of newly-arisen officials, whose encroachments upon the recognised privileges of trade have been allowed, under the plea of war necessity, to be carried to a length that is wholly unwarrantable.

Perhaps one of the best examples of the disorganised state of affairs at present ruling throughout the country may be found in the essential war industries themselves, which have a controlling interest in almost every other subsidiary trade of any importance. It is not unreasonable to expect that, after the valuable experience acquired in the three years that have elapsed, and the absorption and control of the best brains and equipment the country possesses, the war industries themselves would, at least, be conducted on sound business-like lines; yet, to judge from the complaints that are continually being made from various sources, this is, perhaps, far from being the case.

The source of the disorganisation proceeds very largely from the Government offices themselves. Whereas, until 12 months ago, they could be relied upon to pay their accounts in reasonable time and in good order, the complaint is being heard all round of the confusion and delay of the Government offices in not only failing to remit accounts long after they are due, thereby involving considerable financial inconvenience among traders, but in even failing to keep in proper order elementary records of consignments of

goods of which, long after they have been consumed, they have to admit "no trace."

As regards the railways, which are under Government control, the conditions are no better. It is almost a regular daily occurrence for one Government Department to insist upon every other interest being put aside until an urgent demand is executed, only to afterwards learn that the goods have been held up in the warehouse or at the station for intervals of a week or a fortnight while the railway companies among themselves decide when to carry them.

That the railways, which are one of the vital arteries of trade, and especially of war organisation, are hopelessly understaffed, and that the purely military demands upon them have been far too liberally responded to, there can now be very little doubt whatever. The Government was long ago warned of this impending danger by responsible business men, but once again the military influence overruled the commercial. It is, perhaps, a somewhat significant fact that whenever complaints are made as to the shortcomings of British trade organisations, as compared with those of other countries, either in peace or war times, the British railways are almost invariably found to rank among the chief offenders.

The continued increase in the wages bill presents, perhaps, one of the most perplexing problems a business management has ever had to contend with. Whatever doubts the employer may entertain as to the Government's wisdom in keeping down discontent in other directions by imposing these additional burdens upon trade, he has practically no voice whatever in the matter while the Government has the power to dictate what he must do.

We have no desire to criticise the Government upon what it considers the best policy under the existing difficult and unprecedented conditions, but we should feel more reassured, as regards the future, if the Government openly declared its intention, as we have before suggested in these columns, it ought, in common fairness, to offer to do, not to abandon the employers after the war to settle as best they can this chaotic problem of wages readjustment, in connection with which so much bitter controversy and discontent are likely to be associated.

NEW PATENTS APPLIED FOR, 1917.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford.

16,103. "Insulator and binder for telegraph, telephone, electric, &c., wires." A. Spencer. November 5th.

16,116. "Magneto-electric machines." G. Bowron. November 5th.

16,120. "Maintaining constant voltage in lighting circuits." Akt. Ges. Brown, Boveri et Cie. November 5th. (Germany, November 11th, 1916.)

16,122. "Constitution of the magnetic circuit in electric ignition apparatus for internal-combustion engines." Akt. Ges. Brown, Boveri et Cie. November 5th. (Germany, January 12th.)

16,136. "Electric accumulator boxes." C. R. D. Pritchett, & Pritchett and Gold & Electrical Power Storage Co. November 5th.

16,145. "Electric furnaces." N. Prentice. November 5th.

16,154. "Vats for accumulators, batteries, etc." Etablissements de Dion Bouton Soc. Anon. November 5th. (France, January 11th.)

16,179. "Incandescent lamps." W. D. Hamilton. November 6th.

16,194. "Starting devices for internal-combustion engines." A. L. M. Ayres & J. Gray (Reynolds & Ayres). November 6th.

16,201. "Engine-starting apparatus." G. Green & F. May. November 6th.

16,202. "Electric switches." A. Holt. November 6th.

16,223 & 16,224. "Electric heating and cooking apparatus." W. H. Sennett. November 7th.

16,231. "Telephone receivers." A. Marr. November 7th.

16,244. "Electric signalling system." F. G. Bell, W. C. Davey and Sterling Telephone & Electric Co. November 7th.

16,248. "Electrically-heated gauntlet gloves." C. G. Nobbs. November 7th.

16,261. "Electric accumulators." W. H. Exley & H. Leitner. November 7th.

16,263. "Railway signalling." McKenzie, Holland & Westinghouse Power Signal Co. & Union Switch & Signal Co. November 7th.

16,264. "Railway signalling systems and relays for use therein." McKenzie, Holland & Westinghouse Power Signal Co. & Union Switch and Signal Co. November 7th.

16,265. "Magneto-electric machines." British Thomson-Houston Co., (H. W. H. Warren & A. P. Young. November 7th.

16,266. "Magneto-electric machines." British Thomson-Houston Co., A. G. Salisbury & A. P. Young. November 7th.

16,267. "Magneto-electric machines." British Thomson-Houston Co. and A. P. Young. November 7th.

16,276. "Rheostats." Sir W. G. Armstrong, Whitworth & Co. & W. E. Dalby. November 7th.

16,279. "Regulating shunt dynamos." Akt. Ges. Brown, Boveri et Cie. November 7th. (Germany, November 11th, 1916.)

16,286. "Terminal connectors for electrical conductors." O. Zimmerman. November 7th.

16,317. "Means for controlling electric lighting of motor vehicles." W. Curtis. November 8th.

16,320. "Conduit fittings for electrical wiring installations." W. F. Boyd. November 8th.

16,321. "Device for closing orifices in roof and walls of electric furnace through which electrodes pass." W. Travis & T. H. Watson & Co. November 8th.

16,339. "Deposition of metals by electrolysis." M. A. Bolton & A. Walker. November 8th.

16,354. "Magneto-electric machines." British Thomson-Houston Co. and A. P. Young. November 8th.

16,374. "Sparking plugs for explosion motors." G. de Brandner. November 8th.

16,394. "Galvanic batteries." G. Oldham & J. Oldham. November 8th.

16,398. "Spark plugs." F. Gerken. November 8th.

16,426. "Railway signalling and high-frequency selective devices for use therein." McKenzie, Holland & Westinghouse Power Signal Co., and Union Switch & Signal Co. November 9th.

16,434. "Dynamo-electric machinery." E. Greenhalgh, B. Longbottom and Lo-Thermo Patents, Ltd. November 9th.

16,439. "Aerodrome lighting for landing of aircraft." Callender's Cable and Construction Co. November 9th.

16,448. "Microphones." H. S. Allen. November 9th.

16,449. "Electro-magnetic heating apparatus and elements." Soc. des Moteurs Salmson (System Canton-Unné). November 9th. (France, November 20th, 1916.)

16,465. "Sparking plug." E. A. Baron, G. Baron & J. J. Baron. November 9th.

16,475. "Electrical heating apparatus for application to clothing and fabrics." A. H. Curtis, Igranic Electric Co. & S. R. Wright. November 9th.

16,477. "Electrically-heated gloves." C. N. Holmquist. November 9th.

16,499. "Starters for electric motors." Electric & Ordnance Accessories Co. & N. G. Langrish November 10th.

16,507. "Electric furnace." C. H. Vom Baur. November 10th.

16,516. "Jointed arms or brackets for carrying incandescent electric or gas lamps." H. C. Tofield. November 10th.

16,517. "Electrical alternating current relays." Electric Control, Ltd., and O. Elefsen. November 10th.

16,532. "Electric vehicle, &c., lamps." W. H. Eggbton & H. Lucas. November 10th.

PUBLISHED SPECIFICATIONS.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1916.

10,576. High-frequency Generators for Wireless Telegraphy and Telephony. J. Bethenod & E. Girardeau. August 10th, 1915. (101,148.)

12,559. Automobile Signals and the like. E. T. Gray & A. T. Hoevet. September 5th, 1916. (110,373.)

13,080. Telegraphy. J. S. Withers (K. C. Cox). September 14th, 1916. (110,374.)

13,671. Dynamo-electric Machines. British Thomson-Houston Co. & A. P. Young. September 26th, 1916. (110,376.)

14,812. Electrodes for Secondary Batteries. S. F. Tyler & E. H. Naylor. October 18th, 1916. (110,396.)

14,859. Electricity Multicore Cable Dividing Boxes or Apparatus. British Insulated & Helsby Cables, Ltd., & R. W. Blades. October 19th, 1916. (110,399.)

15,242. Electric Heating and Melting Furnaces. V. Stobie. October 26th, 1916. (110,409.)

15,742. Dynamo-electric Machines. A. H. Midgley & C. A. Vandervell and Co. November 3rd, 1916. (110,421.)

16,041. Electric Signalling. H. Green. November 9th, 1916. (110,424.)

17,048. Electric Heating Apparatus. M. J. Railing, J. H. Farthing & F. Winstanley. November 28th, 1916. (110,438.)

17,158. Apparatus for Detecting Fire-damp in Mines. T. J. Thomas. November 29th, 1916. (Addition to 15,094/15.) (110,439.)

18,054. Railway Signalling System. E. Paganini. December 23rd, 1916. (102,953.)

1917.

1,453. Means for Locking Electric Lamps in their Sockets. G. R. Beith and British Agencies, Ltd. January 29th, 1917. (110,462.)

2,494. Manufacture of Armature Driving Spindles for Magneto-electric Machines. F. R. Simms & Simms Motor Units, Ltd. February 20th, 1917. (110,466.)

3,125. Apparatus for the Electrolytic Production of Copper and other Metals. March 2nd, 1917. M. V. Garin. (110,474.)

4,237. Electrical Condensers and Process of Making same. Philips, Brinton Co. March 23rd, 1916. (105,333.)

4,800. Sparking Plug. F. A. Saxelby, F. H. Bluemel & Bluemel Bros. April 4th, 1917. (110,492.)

4,865. Plug Connections for Electric Circuits. H. Lucas & W. H. Edwards. April 4th, 1917. (110,493.)

5,267. Ignition Dynamo-electric Generators. L. J. le Pontois. April 13th, 1917. (110,496.)

7,004. Electric Lampholders. Cable Accessories Co. & F. H. Reeves. May 16th, 1917. (110,509.)

7,150. Wireless Telegraphy Aerials. S. Hall. May 18th, 1917. (110,513.)

9,801. Electric Switches. H. H. Berry & W. J. Markham. July 6th, 1917. (110,523.)

10,113. Electrodes for use in Electrolytic Gas Generators. I. H. Levin. December 20th, 1915. (Divided application on 15,357/16.) (108,477.)

11,867. Heating Conductors of Thermic Telephones. Naamlooze Vennootschap de Nederlandsche Thermo-Telephoon Maatschappij. September 15th, 1916. (109,797.)

Electric Lighting and the Value of House Property.—In the Bow County Court, last week, Judge Graham, K.C., decided that to have a house fitted out with electricity enhanced its value. Messrs. E. J. Rose & Co., Ltd., sued Wm. Geo. Shinnd, of Chiswick, to recover £23. Defendant decided to move out of London in a hurry, and saw Messrs. Trimming, the agents for the plaintiffs, about a house at Teddington, and it was alleged that he agreed to take it on a three years' lease. Fitting it out with electricity was spoken about, and the plaintiffs agreed to pay half. Top speed was the only question, and the work was proceeded with at once, the completion being promised in eight days. The house had to be papered as well, and he chose the paper. The electric lighting actually cost £26 10s., of which they were asking £13 5s. When they sent the agreement to him to sign, however, he refused, saying his wife was too ill to be moved. They had done the work, and wanted the payment. Mr. Singleton, of Messrs. J. Singleton and Sons, electric light fitters, Hampton Hill, said they fitted the electric light. He did not think it enhanced the value of a house much, as some people wanted gas, and were quite content with it for light as well as for cooking. The plaintiffs said that electric light would not benefit at all, as people did not specify for it. He did not consider electric light was a factor in the matter at all. The defendant said they promised to send the agreement along for signature in two days, but it did not arrive for four, by which time he thought it was off, and had taken another house. Counsel for the defence said it was a preposterous claim that this house should be fitted with electric light and he should not be allowed a penny for it. Anybody knew that fitting a house with electric light increased its value. Judge Graham decided that the value was increased, and gave a verdict for the plaintiff for £21 only, and costs.